PAPER TRADE JOURNAL

JANUARY 10, 1946

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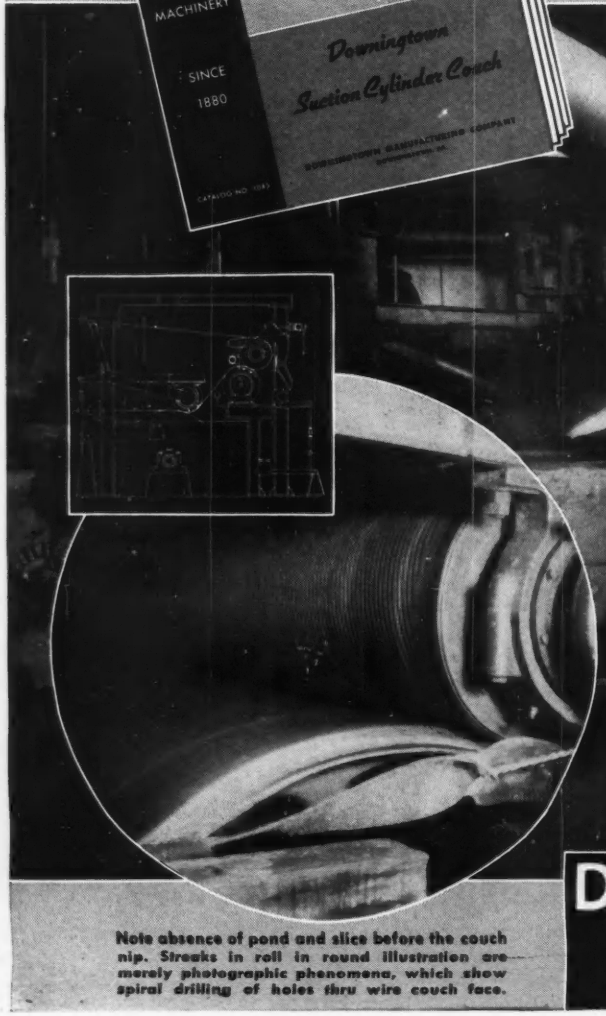

Note absence of pond and slice before the couch nip. Streaks in roll in round illustration are merely photographic phenomena, which show spiral drilling of holes thru wire couch face.

DOWNINGTOWN
Designers & Builders
Paper Making Machinery

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.
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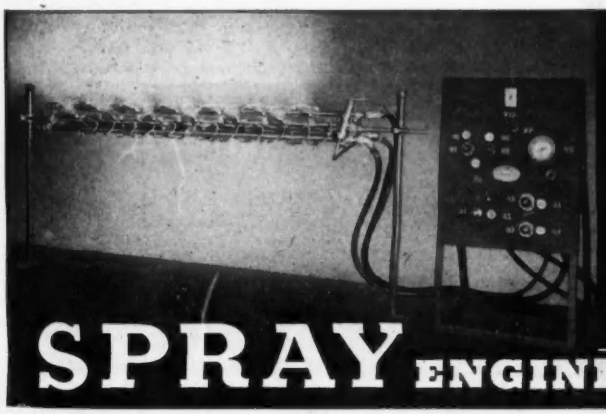

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Vol. 122, No. 2

PAPER TRADE JOURNAL

Title Reg. U. S. Pat. Off.

January 10, 1946

Canadian Paper Supply Tight and Restricted

Twelve Orders Controlling Production and Distribution Still In Force—Book and Fine Papers In Shortest Supply—Labor Situation Better But More Forest Workers Are Needed To Cut Pulpwood.

MONTREAL, Que., January 7, 1946—Progressive relaxation of the wholesale wartime controls over the business and economic life of the Dominion has been proceeding so rapidly that in a survey issued from Ottawa a day or two ago it was announced that only 34 of the war peak total of more than three hundred Prices Board orders controlling the production and distribution of goods now remain in effect, although in addition there are still numerous Board restructions aimed at holding prices against inflationary tendencies and a few remaining restrictions limiting the consumption of meat, sugar, butter and preserves.

It is significant, however, of the tight situation in the paper supply, in relation both to domestic and export demand, that of the remaining 34 orders in effect no fewer than twelve control the distribution and manufacture of various papers and allied products, ranging from newsprint and book paper to paper towels, cardboard containers and cellophane wrappers. The situation in respect to these products of the pulp and paper industry is such that while more of these commodities are being produced than ever before, the shortage looms up as such a handicap to expanding production in the printing and publishing industry for 1946 that although a number of U. S. publications, notably in the magazine field, are putting on drives for large increases in circulation in Canada, the circulation of domestic newspapers and popular magazines is being held at restricted war levels by paper scarcity and promise to remain thus restricted for an indefinite period.

In addition fine papers in the commercial field are in short supply, with no substantial relief in sight, this applying especially to book papers, high grade bonds and other rag-content papers. It is conceded that the many new uses found for paper is a factor contributing to the shortage, but the main reason is held to be a pent-up demand for commercial printing.

Another product of the industry in short supply is insulating board, for which there is an insistent demand, sales being limited only by ability of the mills to produce. While the prospects are that the board mills will be able to increase their production considerably during the year, the shortage is likely to continue, as no new mills can possibly be completed for at least 18 months.

Meanwhile it is being emphasized that waste paper is still "critically needed," and renewed energy is being put into the drives for waste paper collection, which, it is stated, has taken a serious slump.

Labor Situation Improves

A favorable factor in the situation is that the acute manpower shortage all through the paper and allied industries is disappearing, although the supply of skilled help is still short of demand and the disinclination of many able-bodied men to join the forces working in the logging camps keeps the number of men cutting pulpwood considerably below the greatly expanded total in demand.

The Minister of Labor and the Minister of Reconstruction have issued a joint statement to the effect that for the first time in more than three years there is sufficient labor, to meet all reasonable demands. While it is not anticipated that this situation will last for long, as increased industrial production and construction programs will be operating in the spring, they point out that: "The present situation offers an opportunity to employers. Those who have been in the lower labor priorities throughout the war can now obtain additional help, and those who immediately expand their working forces can now obtain adequate help. Present schedules should be expanded to include an additional shift where this is warranted. The labor is available now and may not be there later on."

Forests Greatest Economic Element

The forest resources of Nova Scotia are "the one remaining element" in the economic structure of that province that holds the greatest potential possibilities for expansion, according to a year-end statement of the Hon. J. H. McQuarrie, provincial Minister of Lands and Forests. He announces, therefore, a Government policy and program, backed by adequate organization, to obtain from the forests of Nova Scotia "the closest and fullest utilization of the raw material by the institution of a system of sound and proper forest management." The program embraces the systematic harvesting of mature timber, improvement of distribution and merchandizing methods, the best methods of conservation to protect and preserve the forests and to put them on an annual crop basis, and the exploration of new markets, all being aimed at making the forest products industry "the top industry of the province in value and social significance."

He says that the accomplishments of his department have already provided a firm foundation on which to build a comprehensive future program, and lists the following as among the more recent steps which have

(Continued on page 30)

Discuss Forest Resources of Wisconsin

Folke Becker, President of Rhinelander Paper Co., Sees Prosperity If Forestry Efforts Match Progress of Laboratories — Planning Board Issues New Study of Natural Resources — Other News.

APPLETON, Wis., January 7, 1946—While the Wisconsin State Planning board at Madison, Wis., last week pointed to the "precarious" raw material supply situation, and listed the perpetuation of the industry as one of the state's basic economic problems, Trees for Tomorrow, Inc., pointed to achievements in forestry during the last year and outlined its hopes and aims for the future.

Folke Becker, president of the Rhinelander Paper Company, Rhinelander, Wis., and of Trees for Tomorrow, said that northern Wisconsin will prosper in the new era of wood utilization that lies ahead if its forestry efforts match the steady progress of science in the laboratories of America.

Trees for Tomorrow is an association of Wisconsin River Valley paper mills and is pushing tree planting and forest management through schools, farmers, industries and other groups. Four million trees were planted in various northern areas during the year just ended, the report showed.

Asserting that wood today ranks as the most vital of American resources, Mr. Becker said that "it has a truly remarkable future in the new wonder age of plastics."

He said that the giant strides made by science in wood utilization during the war years and before establish "a hypothetical slide rule with which to calculate the economic future of the north.

"Common sense dictates," he said, "that it is just good business to maintain a pace in forestry that matches the steady progress of science in our laboratories. Wisconsin's present and future forests will pay greater dividends to all concerned if they are used wisely, protected and renewed."

The organization hopes that private and public tree planting will soon reach a total of 100,000,000 trees annually.

The state planning board discussed the raw material situation in a new volume of studies on Wisconsin natural resources, entitled "A Picture of Wisconsin." It emphasized the social and economic importance of a progressive and active reforestation and forest protection program for Wisconsin and suggested the wisdom of public controls on private forest land cutting.

Few industries are more important to the state than the paper industry, the board said, adding, "No Wisconsin industry dependent on the forests for raw material is in a more precarious position."

It said that Wisconsin mills buy more than a million cords of pulpwood in normal years at a cost of more than $12,000,000. Less than one-half of their supplies today come from Wisconsin forests. They are drawing heavily on Michigan, Minnesota and Canada, especially for higher-grade wood such as spruce, which enables them to make a superior product, the book pointed out.

To survive, those mills must have an adequate supply of wood within a reasonable hauling distance, the study warned, and added:

"Communities and states give much thought to securing new industries. How much more logical it is to do what is necessary to perpetuate an industry as important as the paper industry in Wisconsin.

"The economy of the Fox River Valley, of the Wisconsin River Valley from Nekoosa to Rhinelander, and to some extent the valley of the Chippewa depends on the paper and allied products industry."

The board reported that there are 123 establishments in Wisconsin making paper and allied products.

K-C Corp. to Use Quonset Huts

Kimberly-Clark Corporation, Neenah, Wis., announced January 3 that it will erect six Quonset huts to provide temporary housing for personnel in the firm's enlarged field service division. The huts are expected to be ready for occupancy by February 1.

The huts will adjoin the Kimlark plant, new headquarters for the engineering division and its field service section. The building area will measure 72 by 106 feet, with an initial housing capacity of 50 men.

Building code requirements will be met. The devopment will include dormitories, shower, locker and general toilet facilities, a recreation hall, and kitchen and dining room facilities. The project is designed for temporary and emergency use.

Universal Co. to Occupy New Building

Universal Paper Company, Appleton, Wis., wholesalers of general paper products, expects to occupy its new building about March 1, according to T. J. Schrage, president.

The new building, to be used as a warehouse and office, is 90 by 145 feet, and will have a loading dock, 17 feet wide and 56 feet long. It is being built west of Appleton Junction.

The structure is of concrete, steel and brick, and will be of modern and fireproof design. Cost is estimated at $60,000.

Nekoosa-Edwards Makes Gift

Announcement of a gift of $48,000 by the Nekoosa-Edwards Paper Company to the Village of Port Edwards, Wis., was made last week by John E. Alexander, company president. The gift brings to a total of $98,000 the sum given toward the construction of the Alexander natatorium on property bequeathed to the community by the late Lida E. Alexander.

The gift was voted at a recent meeting of the Nepco directors.

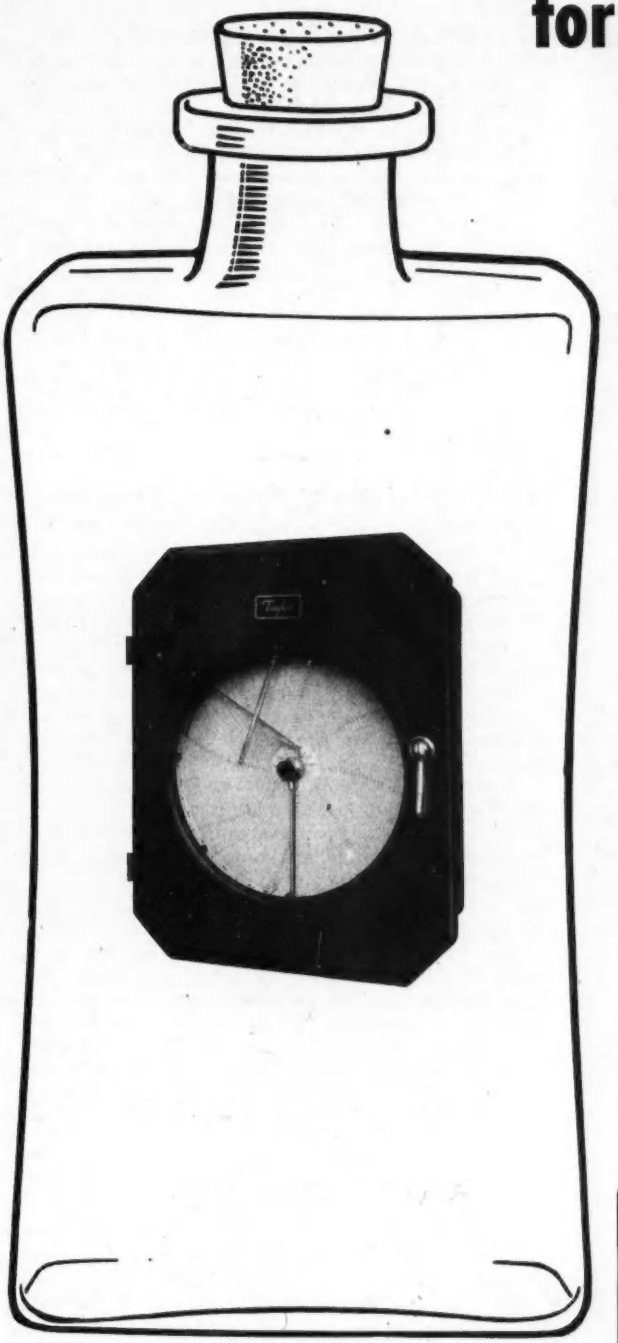
Production at the new corrugated box factory of the Menasha Woodenware Corporation, Menasha, Wis., should be started early in March, company officials estimated January 4.

Except for a new roll storage house, the greater part of the new building has been completed. The former is a little more than half finished.

The factory proper, a one-story structure, 32 by 377, with an L-shaped wing joining on to the remodeled storehouse and present corrugator building, has been completed, but machinery has not yet been installed.

HEADACHE CURE

for Jordan operators!



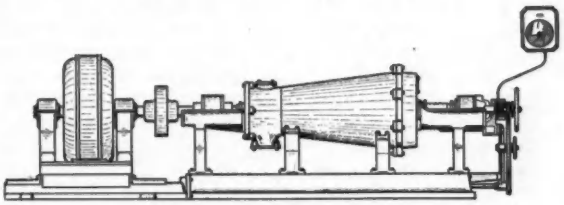
THERE are plenty of headaches for anybody trying to turn out container board stock these days. But you can cure a lot of 'em by installing a *Taylor Jordan Plug Pressure Recorder.*

The point is, Jordaning for container stock is just as important as Jordaning for bond. In either case, you have to deliver the stock to the machine with uniform fibre length and a high degree of uniformity in stock freeness.

There is a definite plug pressure best suited for each furnish and for the type and condition of the Jordan filling. If your processing pressures are greater than actually required for each furnish, the result may be excess power consumption, high maintenance cost per ton, and an unsatisfactory product.

But with a Taylor Jordan Plug Pressure Recorder on the job, you get an accurate, direct record of processing pressures as adjusted for each furnish. By keeping an eye on the chart, your operator can adjust the plug to the pressure best suited to each furnish and thus duplicate previous satisfactory results.

This is just one of many ways Taylor Accuracy can help you keep quality up and costs down. Call your Taylor Field Engineer or write Taylor Instrument Companies, Rochester, N. Y., or Toronto, Canada.



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Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

Chicago Expects Benefit From Price Rise

Higher OPA Price On Nineteen Low-End Grades of Groundwood Specialty Papers Now In Effect Viewed As Spur To Production And Aid To Other Lines — Rail Carriers Criticize Containers.

CHICAGO, Ill., January 7, 1946—The paper trade here is keenly watching the results of recent moves made by the Office of Price Administration and designed to increase the quantity of "B" grades of ground wood paper. Mills have persistently pointed out to OPA—and customers as well—that up until price increases were granted the lower grades, the scarcity in the lower grades as compared to better grades was of OPA origin. In other words, higher grades of paper were made—to the detriment of the lower grades—simply because the price was sufficiently good in the former as compared to a reportedly too low figure in the latter.

Now that OPA has raised prices in the "B" grades of groundwood from $3 to $14 a ton, it is reported here that the mills will go hammer and tongs at the job of producing badly needed lower grades to prove that they were right all along in their contentions with OPA. If the expected tonnage increase does come, local merchants believe it will result in less tonnage of the higher grades because of the over-all limitations in the supply of pulp which are expected to persist until well into the summer.

There is also a belief, locally, that any increases in tonnage in the lower grades will benefit other lines of paper where they have been pressed into service to cover the general ground wood shortage.

Criticize Container Construction

Chicago railroads, representing the greatest concentration of rail shipping in the country, are blaming a 90 million dollar freight loss and damage in 1945 to packaged shipments, and are opening a drive for new and higher standards of both extenior and interior packaging of merchandise freight.

The paper industry is certain to hear a lot about this charge that faulty containers are responsible for much of the loss. It all seems to be predicated on a growing tendency to forward poorly packaged goods and let the railroad pay if damage is done. While shippers will be asked to cooperate to cut down losses, the second part of a big educational program is reported to be aimed at giving container manufacturers a new responsibility in certifying to the compression resistance of boxes as well as to specifications for tensile strength already required.

It is expected that trade associations within the paperboard and folding box and carton industries will be asked to adopt certain standards for container performance. The railroads are said to believe that, if leading manufacturing groups would establish such standards, much of the resistance to better packaging for competitive reasons would disappear. With wartime controls off paperboard, fibreboard containers have substantially improved in quality, according to Nancy Ford, Chicago Journal of Commerce reporter, who ran down a good part of the story. Railroads believe, therefore, that Rule 41 of the consolidated freight classification will soon be docketed for revision and tightening of the specifications for fibreboard boxes which were drastically reduced during the war. If not taken care of soon, then the railroads are reported as hoping that at a later date, it will be possible to incorporate into the rule the compression standards of performance now under development. For the present, however, voluntary cooperation of the industry will be sought.

The container industry, however, should not feel that the railroads are blaming them for all the losses. The railroads point out that war conditions have retarded training programs to teach employees how to stow, brace and unload freight, the proper switching techniques, etc. They also expect smoother road beds, improved snubbers and couplers and new mechanical loading devices to also play a part in reducing shocks to loads and in contributing a great deal to cutting down losses and making for satisfied users—both from the standpoint of the railroad and the container industry.

Zink Retires; Moses Resumes Direction

SPRINGFIELD, Mass., January 4, 1946—John D. Zink, president of Strathmore Paper company, is severing his connection with the company shortly, it was learned today. Zink is now in Florida, ostensibly on a vacation, but his formal departure from Strathmore will take effect early this month. Horace A. Moses, chairman of the board of directors and founder of the company, is resuming management of the company despite the fact that he is confined to his home for reasons of health, informed sources said.

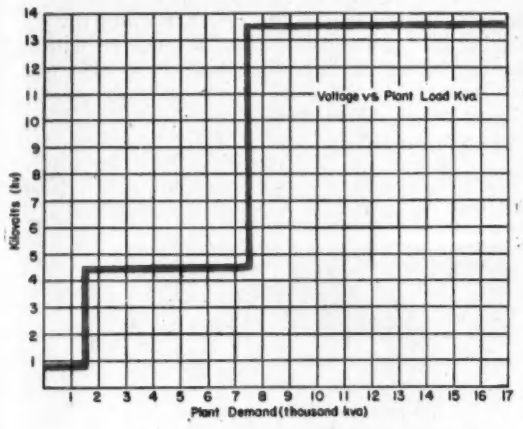
The resignation of Zink as head of one of the nation's best known paper manufacturers has been widely reported in the paper manufacturing industry for several weeks, but has not been officially acknowledged by Strathmore officials.

His decision strongly indicated a breach in the administration of the paper company, for Zink's reelection as president by the board of directors was announced only a short time ago, preceding the annual meeting of the company usually held in January. Other changes in top personnel of the Strathmore company affecting the Rising division in Housatonic, have been made recently at the direction of Moses, it was learned, including the complete elimination of the sales department for the subsidiary company.

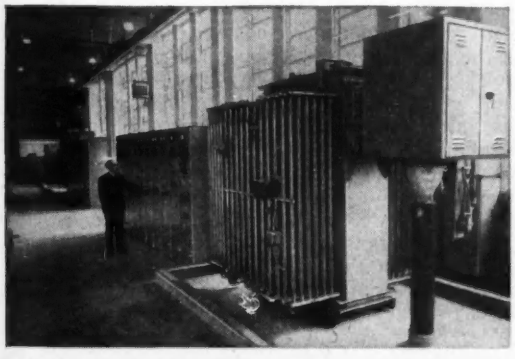
Chicopee Keeps the Mill Running

CHICOPEE, Mass., January 4, 1946—Chicopee residents had a special reason for getting behind a city-wide paper salvage drive this week. They were informed that if the drive wasn't a success the Newton Paper company might have to shut down and throw its employes out of work. Postmaster John Kennedy, head of the paper salvage drive, was informed by officials of the company, that the plant was pretty well out of paper pulp and old newspapers were badly needed.

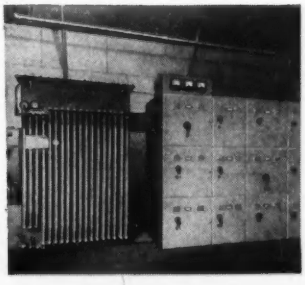
ECONOMICAL VOLTAGE LEVEL for primary feeders in new paper mills has been found generally to follow the red line on the chart at right. In special cases, particularly where generators and other equipment are already installed, an engineering analysis will show the best level for long-term economy.



PRIMARY VOLTAGE TO YOUR 1950 LOADS



5000-kva unit substation—13.8-kv primary—a type having wide applicability to large paper mills. Equipped with Pyranol* transformers, this substation can be installed anywhere in the mill without vaults.



Typical "double-ended" unit substation with 480/277-volt secondary as applied in secondary-selective load-center systems to protect power continuity.

*Pyranol is G.E.'s trade name for askarel, a noninflammable, nonsludging insulating liquid.

480-VOLT (600 or below) distribution from a central switchboard is definitely uneconomical where plant demand is likely to rise above 1500 kva before 1950. Replacement should be planned at once.

4.16-KV is best for plants of moderate size, in contrast to 2.4-kv distribution—the preferred voltage in the past. Motors up to 200-250 hp can be operated by load-center step-down to 460 volts at less dollars per hp than directly at 2300 volts. Above this level, 4000-volt motors may be used. Write for GEA-4275 for full explanation.

13.8-KV distribution proves best for big mills where long runs are needed to points of heavy demand. Your present turbines can be tied in to such a system by step-up transformers on a practical cost basis. Illustration opposite shows how present 2.4-kv system can be linked to new 13.8-kv supply.

GENERAL ELECTRIC

Bulkley Dunton Makes Marvin Partner

J. Cliff Marvin has been made a partner of Bulkley, Dunton & Company. Mr. Marvin joined Bulkley, Dunton in 1942 as head of the merchandising division. During his comparatively short association with the company he has distinguished himself as an executive of rare ability and good business acumen, with a knack for getting along with people.

Mr. Marvin started his career in the paper merchandising business in Minneapolis where he was vice-president of the Newhouse Paper Company. During this time he served as president of the North-

J. CLIFF MARVIN

western Paper Trade Association. In 1937 he was appointed as sales executive for the Birmingham and Prosser Company in Chicago. His accomplishments in the expansion program of this company earned Mr. Marvin the reputation of an outstanding organizer. In 1942 he was invited to join Bulkley, Dunton & Co. as head of the merchandising division.

Bringing a broad knowledge and much enthusiasm to his position at Bulkley Dunton, he greatly expanded the size and scope of the company's operations, particularly in the fine paper field. The many friends Mr. Marvin has made in the paper and graphic arts industries will no doubt share his pleasure over being admitted as a Bulkley, Dunton partner.

P & I Exhibits at Chemical Show

Paper & Industrial Appliances, Inc., New York, N. Y. will have their Exhibit at the 20th Exposition of Chemical Industries at Grand Central Palace, Lexington Avenue at 46th Street, New York, N. Y. The Exposition to be held from February 25 to March 2, 1946 will be during the same period of the joint Tappi and A.P.P.M.A. convention in New York City. A complete Brammer Recording Consistency Control will be exhibited. Other P&I products including the Chemipulper, Roll-O-Finer, and Rotabelt will be shown in large illustrations. Mill men are cordially invited to see the P&I Exhibit, Booths 472 and 473, while in New York attending the Convention. They are likewise invited to visit the P&I Laboratory, 122 East 42nd Street, New York City, which is near the Exposition and also Tappi Convention headquarters.

St. Regis Sets Up Sales Subsidiary

NEW YORK, N. Y., January 2, 1946—The St. Regis Sales Corporation has been formed as a wholly owned subsidiary of the St. Regis Paper Company to handle sales of all products manufactured by all divisions of the Company and its United States subsidiaries including Taggart Corporation and Watab Paper Company. President Roy K. Ferguson, citing the move as a means of enabling the company to increase its sales service to customers, stated that the personnel and operating method of the parent company's business remains unchanged. All products manufactured by the St. Regis Paper Company and its United States subsidiaries and all products purchased from other manufacturers for re-sale to customers will be sold and invoiced through the new sales organization.

In addition to Mr. Ferguson, officers of the St. Regis Sales Corporation are: E. R. Gay, C. R. Mahaney, R. B. Maltby, E. G. Murray and J. A. Quinlan, executive vice-presidents; W. J. Dixon, secretary; W. H. Versfelt, treasurer; and A. T. Plunkett, V. C. Douglas, A. R. Carswell, R. P. Bushman, K. D. Lozier, C. H. Hartman, and P. P. Ryan, vice-presidents.

Directors of the St. Regis Sales Corporation are: R. P. Bushman, A. R. Carswell, W. J. Dixon, V. C. Douglas, R. K. Ferguson, E. R. Gay, C. H. Hartman, K. D. Lozier, C. R. Mahaney, R. B. Maltby, E. G. Murray, A. T. Plunkett, J. A. Quinlan and W. H. Versfelt.

Union Bag Cuts Hours: Raises Pay

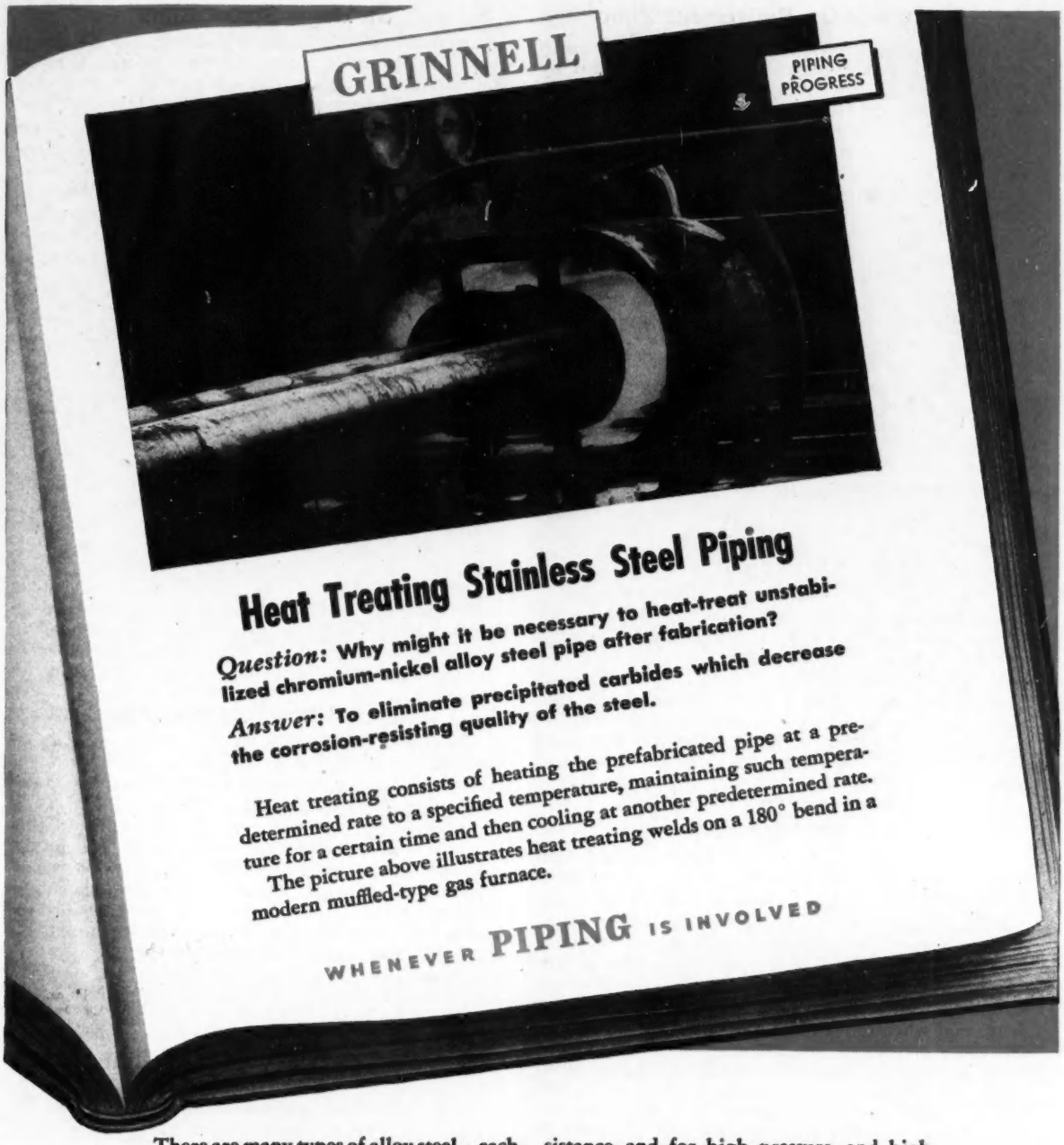
SAVANNAH, Ga., January 4, 1946—According to T. T. Dunn, resident manager, shortage of pulpwood will cause the giant plant of the Union Bag & Paper Corporation to operate only five days a week for the next several weeks. Mr. Dunn said the plant will be closed this Saturday and Sunday, and it is planned to close the entire plant for the next few week-ends. "Wet weather in recent weeks, which kept woodsmen idle, is responsible for Union Bag temporarily resorting to a five-day week to permit dwindling woodpiles to build up," he explained.

It was pointed out that a wood shortage caused the plant, the largest integrated pulp and paper mill in the world, to shut down for several days in April of 1944. Mr. Dunn was quick to emphasize that a brightening of the wood supply picture would mean full operation before the three weeks period now allotted for it to clear. He said as soon as the pulp wood begins to roll in, Union Bag would be back on full-time operation.

"The plant will operate five days, or 120 hours a week, while for the 4,000 employes it will mean five days, eight hours a day, or forty hours a week," it was explained. "With the shorter work week will go the 13 per cent wage increase agreed to at the labor-management parley here last month."

Time Buys Hennepin Mill

LITTLE FALLS, Minn., January 5, 1946—The Hennepin Paper Company has been purchased by Time Incorporated. The mill is located at a dam on the Mississippi river about a hundred miles above Minneapolis. It will be operated for Time Incorporated by the St. Regis Paper Company. In the past, most of the mill's capacity (15,000 tons a year) has been devoted to newsprint and groundwood specialties, but it can also make other grades of paper for coating.


GRINNELL
PIPING IN PROGRESS
Heat Treating Stainless Steel Piping
Question: Why might it be necessary to heat-treat unstabilized chromium-nickel alloy steel pipe after fabrication?
Answer: To eliminate precipitated carbides which decrease the corrosion-resisting quality of the steel.
Heat treating consists of heating the prefabricated pipe at a predetermined rate to a specified temperature, maintaining such temperature for a certain time and then cooling at another predetermined rate.
The picture above illustrates heat treating welds on a 180° bend in a modern muffled-type gas furnace.
WHENEVER PIPING IS INVOLVED

There are many types of alloy steel – each with its own particular properties and characteristics, such as reactions under the heat of welding and bending. Grinnell engineers are familiar with these reactions and have developed closely controlled and metallurgically supervised procedures for fabricating alloy piping to obtain the full advantages of alloy steels for corrosion resistance and for high pressure and high temperature applications.

Whatever the piping requirements, Grinnell has the specialized engineering knowledge and experience to handle the job – from first plan to actual operation. Grinnell can supply everything from a tiny tube fitting to a complete power plant installation.

GRINNELL COMPANY, INC. Executive Offices, Providence 1, R. I. Branch warehouses in principal cities. Manufacturing Plants: Providence, R. I.; Cranston, R. I.; Atlanta, Ga.; Warren, Ohio; Columbia, Pa.

GRINNELL

WHENEVER PIPING IS INVOLVED

Scott Sets Up Retirement Plan

CHESTER, Pa., January 7, 1946—A retirement plan for all of its employees has just been adopted by Scott Paper Company, according to an announcement by Vice-President Raymond C. Mateer. The plan contains several unusual and liberal features.

The company bears the entire cost of the plan for employees with incomes up to $5,000 a year. An employee contribution of 4 per cent is required only on that portion of earnings which exceed $5,000 a year. Another unique feature of Scott's newly adopted policy is that benefits are calculated on the average of the five years of highest earnings in the last ten years before retirement. This basis is used rather than an average of earnings over a longer period, so that an employee's retirement benefits will better enable him to maintain the standard of living to which he has become accustomed.

The plan which results from two years of careful study, is retroactive to January 1, 1945, and present employees will receive credit for past service up to fifteen years. Military leaves of absence count as service, for the purpose of the plan. The retirement age is 65. Employees may retire at age 55, after 20 years of continuous service, at a reduced benefit.

The Scott plan is administered by a retirement board made up of employees and officers of the business headed by Vice-President G. Willing Pepper.

All payments to the retirement fund will be deposited with the trustee, Guaranty Trust Company of New York.

It is the intention of Scott's Board of Directors that the retirement plan shall shortly include its subsidiaries, Coos Bay Pulp Corporation, with plants at Empire, Ore. and Anacortes, Wash., and Marinette Paper Company, with plants at Marinette, Wis., and Fort Edward and Glens Falls, N. Y.

H. & W. Unions Accept Raise

WATERVILLE, Me., January 2, 1946—A wage dispute between three A. F. of L. unions and the management of the Hollingsworth and Whitney Company has ended with the acceptance by the unions of the company's offer of a 12½ per cent pay increase.

The Brotherhood of Paper Makers and the Brotherhood of Pulp, Sulphite and Paper Mill Workers had originally asked for a flat increase of 20 cents an hour, and when offered the 12½ per cent increase by the company, the latter union voted to reject the offer in favor of reopening negotiations. Later, however, the committee from the dissatisfied union was empowered to accept the offer which it did. The new rate of pay was retroactive to December 24, and will affect the Madison branch of the Hollingsworth and Whitney Co. as well.

Dean Back at AWP Desk

HOLYOKE, Mass., January 4, 1946—Maurice F. Dean has returned to his duties at the general offices of the American Writing Paper corporation. Dean, a captain in the army air forces, recently completed his terminal leave. The former Holyoke high and Amherst college athlete, joined the air corps as a flying cadet early in 1941. Shortly after the outbreak of the war he was shipped to England as navigator and co-pilot of the famous bomber Ziggy. After flying several missions from English bases he was transferred to Africa, from where he saw further action over the southern European sector. He was promoted to captain while overseas.

St. Regis Strike Ends

DEFERIET, N. Y., January 7, 1946—The St. Regis Paper Company is again operating its mill here on full time following a strike of a portion of employees who are members of the International Brotherhood of Paper makers. The argument caused a cessation of operations in the entire plant for several days. John P. Burke, president of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers, stated that the strike did not involve any members of his union. He said that several weeks ago an agreement was made by his organization, plus the International Brotherhood of Papermakers, and unions represented at the St. Regis mill, to the effect that employes would return to a forty-hour week from forty-eight hours as soon as enough help was available to permit it.

Mr. Burke stated that at the Deferiet plant, one of the several branches affected by the agreement, an attempt was made to place one or two of its four machines back on a forty-hour week and leave the others on a forty-eight-hour week until help was more plentiful. Members of the International Brotherhood of Papermakers wanted all of the machines on either a forty or forty-eight-hour week at the same time which caused the trouble. Without the papermakers the plant was forced to shut down and about 240 other employes not involved in the dispute were made idle. Mr. Burke also stated that his organization has always enjoyed the most amicable relations with the St. Regis Paper Co. and is not now in any disagreement with it.

Groveton Force to Elect Agent

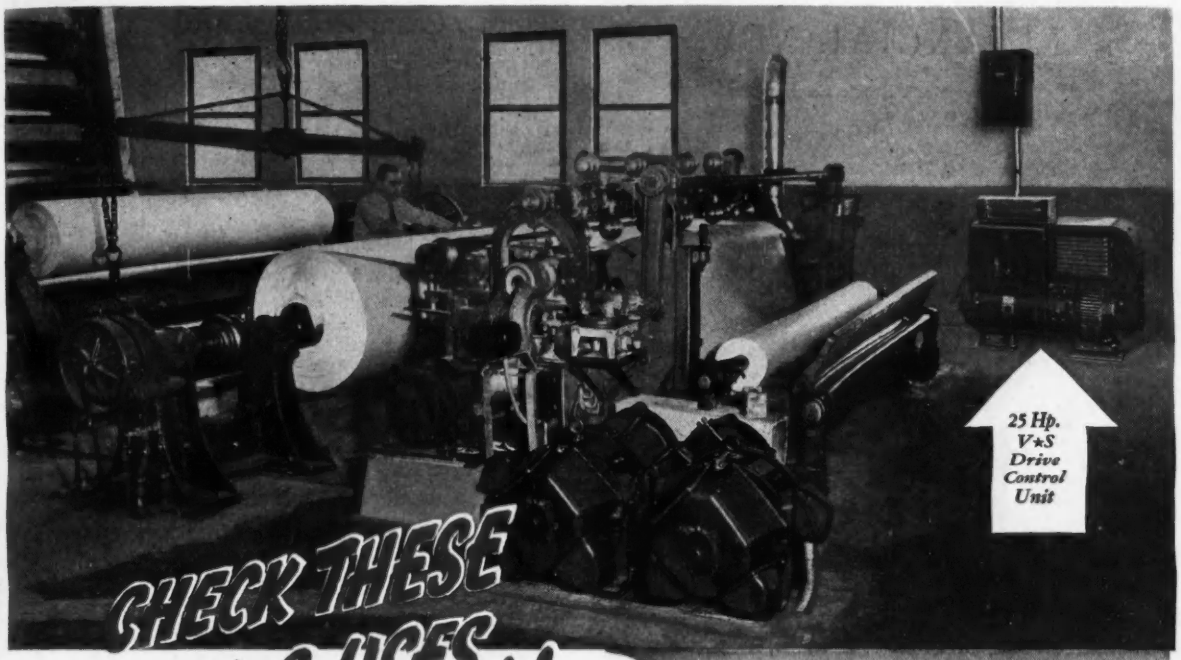
GROVETON, N. H., January 2, 1946—A consent election to determine a bargaining agent for employes of the Groveton Paper Company, has been ordered by the National Labor Relations Board, Cecil Crawford, sub-district director for the United Mine Workers has announced. Crawford said he expected to meet soon with representatives of the company and two A. F. of L. unions which now have bargaining rights, to set a date for the balloting requested by the UMW. A. F. of L. unions now holding bargaining rights at the company are the Brotherhood of Paper Makers and the Brotherhood of Pulp, Sulphite and Paper Mill Workers. About 550 workers are employed at the Groveton plant.

To Sell Brownville Holdings

BROWNVILLE, N. Y., January 7, 1946—Samuel A. Upham, president and controlling owner of the Brownville Paper Company, plans to sell his holdings of stock after fifty years of active participation in the affairs of the firm. During the past week he announced he would transfer his interests to business associates. The shares will go to Robert L. Pease, vice president, who will become president, and Seymour M. Jones, secretary-treasurer, James H. Lingenfelter, Alfred L. Soper and Albert W. Horr, long associated with the company.

Labor Board Orders Rogers Vote

BAR MILLS, Me,. January 5, 1946—Votes were cast January 2 by workers of the Rogers Fibre Company, Inc., here to select agents for the purpose of collective bargaining after the National Labor Relations Board in Boston ordered the election late in December. Workers at the Rogers plant in Poland, Me. voted to determine union representation on January 3.



CHECK THESE 14 V★S USES..

130-inch Beloit Two-Drum Winder in operation at the Ward Paper Co., Merrill, Wisconsin.

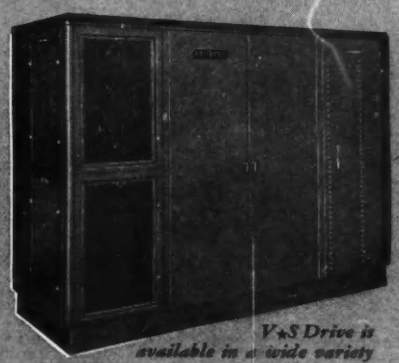
To Speed Production and Cut Costs

This *all-electric, adjustable-speed drive operating from A-c. circuits,* provides *smooth* starts and *smooth* acceleration and deceleration—automatic maintenance of proper tension—and an ease and flexibility of control that can meet practically any production requirement. The natural result is a marked improvement in quality and uniformity of finished product.

Here are 14 of the important types of paper mill machines where Reliance V★S Drive is delivering outstandingly satisfactory results. Checking this list may suggest some places where you can employ V★S Drive to advantage:

Winders	**Coating Machines**	**Corrugators**
Cutters	**Printing Machines**	**Vacuum Filters**
Slitters	**Laminating Machines**	**Washers**
Bag Machines	**Carton Machines**	**Shake Drives**
Waxing Machines	**Gumming Machines**	

For detailed information on any of these V★S applications, write for Bulletin 311—or call in a Reliance Application Engineer from our nearest office.



V★S Drive is available in a wide variety of ranges, from 3 hp. to the 200 hp. unit illustrated immediately above.

RELIANCE V★S DRIVE

RELIANCE ELECTRIC & ENGINEERING CO.
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Birmingham • Boston • Buffalo • Chicago • Cincinnati • Denver • Detroit • Gary • Greenville • Houston • Kalamazoo • Kansas City • Knoxville • Los Angeles • Milwaukee Minneapolis • New Orleans • New York • Philadelphia • Pittsburgh • Portland, Ore. • Rockford, Ill. • St. Louis • San Francisco • Seattle • Syracuse • Tampa • Washington, D. C.

"MOTOR-DRIVE IS MORE THAN POWER"

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for Week Ending January 5, 1946

STOCKS

	High	Low	Last
A. P. W.	8⅛	8	8⅛
Armstrong Cork Co.	56	54¾	55
Celotex Corp.	23⅝	22½	22¾
Celotex Corp., pf.	21	20⅜	21
Certain-Teed Products Corp.	15⅛	14⅜	14⅜
Certain-Teed Products Corp., pf.	112¾	112¾	112¾
Champion Paper & Fibre Co.	50	49½	49½
Champion Paper & Fibre Co., pf.	111⅞	110½	111⅞
Congoleum Nairn Co.	35¼	34	34⅛
Container Corp. of America	38	37	37
Continental-Diamond Fibre Co.	16⅜	15¼	16
Crown-Zellerbach Co.	30½	29	30½
Crown-Zellerbach Co., pf.	108½	108	108½
Dixie Cup Co.	49½	46½	46½
Dixie Cup Co.—A	54½	53½	54
Flintkote Co.	37¼	35⅛	37¼
Flintkote Co., pf.	111	110¾	111
Robert Gair	9⅜	9	9¼
Robert Gair, pf.	19½	19	19⅛
International Paper Co.	48⅜	46⅛	46¾
International Paper Co., pf.	122½	117¼	118
Johns-Manville Corp.	142	141	141
Johns-Manville Corp., pf.	136	136	136
Kimberly-Clark Corp.	67	67	67
Mac Andrews & Forbes	40	38	39¼
Mac Andrews & Forbes, pf.	155	154⅞	155
Masonite Corp.	59	57½	58
Mead Corp.	22¾	21	22
Mead Corp., pf. A—6%	105	105	105
Mead Corp., pf. B—5½%	105½	104½	104¾
National Container Corp.	28¾	27½	27⅝
Paraffine Companies, Inc.	77	76¼	76¼
Paraffine Companies, Inc., pf.	...	...	...
Rayonier, Inc.	22⅝	21¾	21⅞
Rayonier, Inc., pf.	37¾	37	37½
Ruberoid Co.	46	44	44¼
Scott Paper Co.	59½	58	58½
Scott Paper Co., pf.	...	...	...
Sutherland Paper Co.	40	40	40
Union Bag & Paper Corp.	25	23	23¾
United Paperboard Co.	12¼	11⅝	11⅝
U. S. Gypsum Co.	115	112	112
U. S. Gypsum Co., pf.	...	...	...
West Virginia Pulp & Paper Co.	39	37½	38
West Virginia Pulp & Paper Co., pf.	113	113	113

BONDS

Abitibi Pulp & Paper Co. 5s '53	107¼	107¼	107¼
Celotex Corp. 3¾s '55	...	...	...
Certain-Teed Products Corp. 5½s '53	...	...	...
Champion Paper & Fibre Co. 3s '65	103⅝	103⅝	103⅝
International Paper Co. 6s '55	108	107¼	107½
International Paper Co. 5s '47	103¾	103¾	103¾
Mead Corp. 3½s '53	...	...	...

New York Curb Exchange

High, Low and Last for Week Ending January 5, 1946

STOCKS

	High	Low	Last
Great Northern Paper Co.	43	42¼	42¼
Hummel-Ross Fibre Corp.	13	12⅝	12⅞
St. Regis Paper Co.	10¾	10¼	10⅜
St. Regis Paper Co., pf.	...	...	...
Taggart Corp.	9½	9⅜	9⅜

BONDS

American Writing Paper Co. 6s '61	102	101¾	102

Niagara Falls Starts Year Briskly

NIAGARA FALLS, N. Y., January 2, 1946—The local paper industry is entering the new year with production at a high rate and prospects for an even heavier volume of business in the months ahead.

Kimberly-Clark, maker of paper and sanitary products, is operating on a 48-hour week and expects to step up output. Certain-Teed Products Corp., making roofing materials, is expected to benefit from heavy demand from the building industry.

The Moore Business Forms plant, Gilman and American Salesbook are not taking on any additional employes at this time but no substantial reduction in their employment is expected in 1946. The International Paper Co. plant is on a 48-hour week and "in a state of flux in employment."

The Ralston Paper Company is expecting heavy business in its war-developed paper bag and package products. This company has made a flour sack which can be dropped filled into water without damage to its contents.

Champion Issues Report

The Champion Paper and Fibre Company and its subsidiaries had a consolidated net income of $1,193,352 in the twenty-eight weeks ended on November 11, after all charges and taxes, the report disclosed yesterday. The net is equal to $1.53 a share on 546,000 common shares and compares with $1,072,937, or $1.28 each on 550,000 common shares, for the twenty-eight weeks ended on November 12, 1944.

For the twelve weeks ended on November 11, 1915, the net profit amounted to $488,127, or 68 cents a common share, against $461,502, or 55 cents a share for the corresponding period of the previous year.

Provision for Federal taxes for the twenty-eight-week period has been computed at the average rates applicable to the fiscal year which give effect to rate reduction after January 1, 1946, pursuant to the Revenue Act of 1945.

According to the report, the recomputation of Federal taxes for the six weeks ended on Aug. 19 at the lower rates resulted in an increase in consolidated net income for that quarter of $178,180, or 32 cents a common share, or from the 53 cents previously reported for that period to 85 cents a share.

Rust Contracts Reach Thirty Million

PITTSBURGH, Pa., January 7, 1946—Contracts for approximately $30,000,000 for design and construction of industrial plants and facilities in the paper, drug and chemical field were awarded The Rust Engineering Co. in the past year. The demand for industrial building in 1946 appears considerably in excess of the past year, but the extent to which it can be satisfied is uncertain due to Government controls and labor and material conditions, he also commented.

"The abnormal rate of wear" declared S. M. Rust, Jr., president, "on all industrial facilities during the war, coupled with advances in production processes and new products, has brought a large volume of inquiries about plant expansions and new building in 1946.

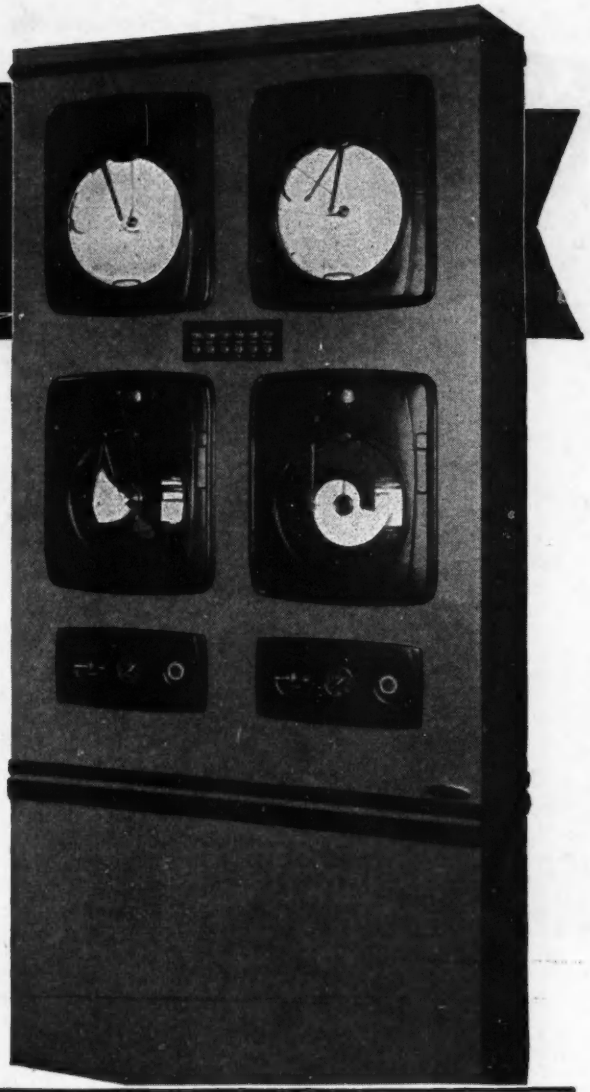
"However, present conditions make it only possible to guess at the extent to which this work can be fulfilled. The undeterminable factors are Government controls, the availability of construction workers, particularly in the skilled trades; and availability of materials.

"Labor controversies may also impede building plans in some industries."

Long Lac Mill Soon to Start

TORONTO, Ont., January 5, 1946—It is learned that the new development of the Kimberly-Clark Corporation of Neenah, Wis., in the Thunder Bay district of northwestern Ontario, calls for an expenditure of $15,000,000. The corporation, through a wholly-owned subsidiary to be known as Long Lac Pulp & Paper Co., plans a modern chemical pulp mill which will give employment to about 3,000 men. Construction is expected to begin this month and it is planned to have the site in operation by 1947. Designing engineers are Stadler & Hunter, Montreal. The contract award is pending. Foundation Company of Ontario recently built a large plant for Kimberly-Clark at Kapuskasing, several miles east of the newest development. Ontario Hydro-Electric commission will supply the new plant with 15,000 h.p. of primary power from a new 45,000 h.p. plant on the Aguasabon River, which will cost about $8,500,000.

NEW—COMPACT—AUTOMATIC "PACKAGED" CONTROL UNIT for Sulphite Digesters!



Streamlined Cabinet Equipped With Advanced Foxboro Instrumentation Assures Closer Control in Pulp Cooking.

The combined performance, convenience, and versatility of this Foxboro development sets a new high in efficiency. It is the result of more than 20 years experience in pulp cooking instrumentation.

Digester heat input and gas relief are automatically regulated by this new unit so that cooking pressure and temperature follow exactly prescribed schedules from start to finish.

This efficient new unit is equally suitable for any type of sulphite digester (see diagrams below).

Get all the facts about this important new development in sulphite digester control. Information also available on similar "packaged" control systems for alkaline digesters. Write the Foxboro Company, 114 Neponset Avenue, Foxboro, Mass., U. S. A. Branches in principal cities.

Foxboro Automatic Digester Control Unit. Supplied complete with following instruments ready-mounted, with wiring and piping completed, in a modern protective steel cabinet: (1) Foxboro Steam Flow and Liquid-Level Recorder with Steam Flow Integrator (top left); (2) Foxboro Dynalog (electronic) Three-Point Temperature and Top Pressure Recorder (top right); (3) Foxboro Cam Schedule Pressure Controller (lower left); (4) Foxboro Cam Schedule Steaming Controller (right).

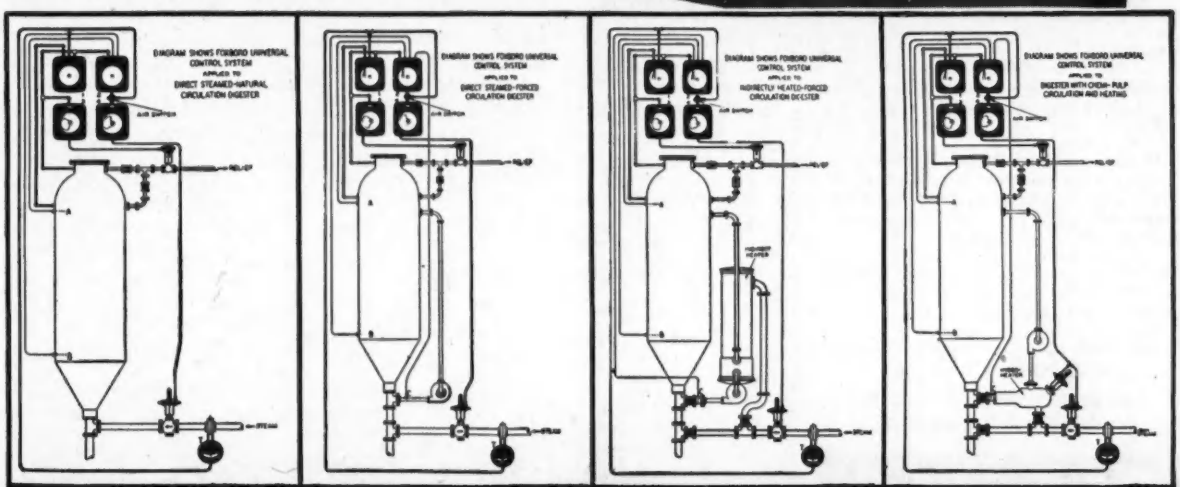


DIAGRAM SHOWS FOXBORO UNIVERSAL CONTROL SYSTEM APPLIED TO DIRECT STEAMED-NATURAL CIRCULATION DIGESTER
DIAGRAM SHOWS FOXBORO UNIVERSAL CONTROL SYSTEM APPLIED TO DIRECT STEAMED-FORCED CIRCULATION DIGESTER
DIAGRAM SHOWS FOXBORO UNIVERSAL CONTROL SYSTEM APPLIED TO INDIRECTLY HEATED-FORCED CIRCULATION DIGESTER
DIAGRAM SHOWS FOXBORO UNIVERSAL CONTROL SYSTEM APPLIED TO DIGESTER WITH CHEM-PULP CIRCULATION AND HEATING

FOXBORO
REG. U. S. PAT. OFF.

AUTOMATIC DIGESTER CONTROL

A JOB *One Man* CAN HANDLE

For moving bales, boxes, crates, drums, barrels with limited manpower, the Reading Multiple Gear Chain Hoist provides a practical solution.

Loads up to 2 tons can be lifted by one man. The load brake holds positively till released. Where I beam trolleys are used, loads can be moved with ease by one man.

Long life is insured by the sealed-in-oil gear unit—an exclusive feature. The all steel construction from hook to hook gives high overload capacity — guaranteed 25% over rated capacity.

See your nearest Reading Hoist distributor for help on your materials handling problems or write direct.

READING CHAIN & BLOCK CORPORATION
2113 ADAMS ST., READING, PA.
CHAIN HOISTS • ELECTRIC HOISTS
OVERHEAD TRAVELING CRANES

READING HOISTS

Hoosiers Seek More Paper

INDIANAPOLIS, Ind., January 7, 1946—In spite of holidays, strikes, and other deterrants to business, the demand for paper of all kinds continued heavy last week. In fact, the demand was so heavy the trade has no hope of cutting into the backlog of orders that has piled up in the past three months. Inventory is virtually over and the trade finds itself with lower stocks than for years and with a demand that is surprising in view of all other conditions.

Government figures which report increased production of book paper, newsprint and paper board, may be encouraging, but the local trade has not been able to secure much increase in any of the three. Jobbers of fine paper report demand for book, ledgers and other fine papers is heavy. Back orders are being filled as rapidly as possible. The outlook in the newsprint field is brighter, if adequate stocks can be secured. The Central Indiana papers are getting all the advertising they can handle.

Much ado is being heard concerning the building situation in the state, but thus far nothing has been done about it. Given adequate materials, demand for roofing and building paper would be enormous. The drawback seems to be in lumber and brick. Adequate stocks are in the local roofing and building paper warehouses. The construction industry is troubled also with a shortage of skilled labor, but this is expected to be relieved by mid-spring.

Box factories continue to produce to the capacity of raw materials and labor. The labor situation is reported to be easing, but the raw material situation is critical yet.

Demand for rags in this market continued heavy with collections falling off. Mill demand is for all grades of old rags and prices all along the line are strong. Mill demand for paper stock also was reported heavy with collections below what they should be. All prices were firm at ceiling levels.

Farris Book Lists Valves

A complete line of safety and relief valves is described in the new catalog No. 45, just issued by the Farris Engineering Company. Many new valve designs and improvements in old designs are included.

Aetna at the Show

The Aetna Scientific Company exhibit at the 20th Exposition of Chemical Industries, Grand Central Palace, New York City held February 25th to March 2nd will display their improved vertical condenser still, laboratory type autoclave, and special Solution still which consists of Aetna's new model PF Still and pyrex receiver, Photographs showing many special stills, autoclaves, sterilizers and special heat exchange devices of interest to laboratory and operating chemists, designers and purchasing agents.

Sprout-Waldron in Chicago

To better serve its customers in the Chicago territory, Sprout-Waldron & Company has appointed Harold J. Alsted as its representative there. Mr. Alsted has had many years of experience that well qualify him for this appointment. For a number of years he was associated with his father in the management of the Alsted Manufacturing Company, manufacturers of attrition mill plates and white iron specialties, and former operators of a feed mill.

For two years he was connected with the B. F. Gump Company, Chicago, in a sales capacity. With Sprout-Waldron Alsted has had two years' experience in the company's main office at Muncy and for a period of three years he was its southeastern representative with headquarters at Birmingham. Initially, Mr. Alsted intends to operate out of Kenosha, Wisconsin. Ultimately, the Company expects to reestablish an office in Chicago.

Atlantic Research to Move

NEWTON, Mass., January 5, 1946—Atlantic Research Associates, Inc. and affiliate National Atlantic Research Corporation may shortly move their laboratories and pilot plant operations to some other location. The company laboratories were temporarily housed at 92 Bowers Street, Newtonville, Massachusetts after sale last month by Atwood Realty Trust of the building at 763 Washington Street, Newtonville. Atwood Realty Trust transferred title to the plant at 40 Glen Avenue to representatives of the Old Colony Knitting Mills who will convert the property to a modern knitting mill.

Stadler Opens a Partnership

MONTREAL, Que., January 7, 1946—John Stadler announces that the engineering office under his name, located in the Drummond Building since 1923, will be known from January 1st 1946, as Stadler Hurter & Company. As heretofore this organization will specialize in pulp and paper mill problems from forest to finished product.

JORDAN BARS CAN LAST LONGER

Jordan plug partially filled with *Monel Bars* and plug bands. Standard on many types of jordans, and safely used in combination with bars of other materials, *Monel plug bands* assure anchorage unendangered by corrosion and corrosion fatigue. *Photo courtesy of Sharple Bros., Middletown, Ohio.*

. . . and cost less!

Frequent replacement of jordan fillings is not only costly . . . but *unnecessary*. Paper and paper board mills have proof . . . in the form of actual *performance records*.

In an *Appleton* jordan, for example, Monel plug bars gave 13 years' service refining bleached sulfite stock for bond, ledger and writing papers.

Monel plug and shell bars in a *Majestic* jordan served six years and nine months on raw stock for coated papers. Monel plug bars and shell bars in two jordans refining sulfite and sulfate stocks for bag and wrapping paper, as well as tissue and M.G. waxing paper, are still in use *after 10 years of service.*

Nor are these isolated cases. Other mills report similar experiences, and some have obtained even longer service from Monel jordan fillings.

Monel, in addition to its inherent ability to withstand corrosion, is extremely tough and possesses high impact resistance. Jordan fillings retain smooth working surfaces. They do not feather, and the edges do not chip. The result is an improved refining action.

Information on Monel fillings may be secured from your regular supplier or from any of the jordan manufacturers. Further data about the refining characteristics of Monel jordan bars, including mechanical properties and hardness specifications, as well as performance and cost records in typical installations, are contained in the folder, *Monel Jordan Bars*. Write us for your copy.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

MONEL NICKEL INCO TRADE MARK ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL
"KR" MONEL • INCONEL • "Z" NICKEL • NICKEL
Sheet . . Strip . . Rod . . Tubing . . Wire . . Castings . . Welding Rods (Gas & Electric)

Ogren Sells Mando to Publishers

MINNEAPOLIS, Minn., January 7, 1946—Rondeau O. Warner, sales manager of the Paper Division of Minnesota and Ontario Paper Company, has appointed Oscar Ogren as salesman of groundwood printing papers to periodicals. 'Oscar' brings to the

OSCAR OGREN

trade a background of 29 years experience in the manufacture and merchandising of paper. For the past few years he has acted as newsprint service representative, contacting newspapers in the Midwest, and in addition filled supervisory duties in connection with the maintenance of quality by M. & O.'s three mills. He is further qualified for his new assignment by active experience in sales and customer problems, together with special studies he has made of printing.

A native of International Falls, Mr. Ogren came to Mando in 1917. His employment in the paper mill was interrupted when he volunteered for military duty in World War I. After his discharge, he advanced successively to finishing room foreman, chief order clerk, chief paper sales clerk and salesman.

Wright Back at Whiting Desk

HARVEY, Ill., January 7, 1946—C. Q. Wright has returned to the Whiting Corporation, in the capacity of vice-president dealing with special staff work. Capt. Wright served as a submarine commander in World War II and has behind him a long brilliant record of naval service starting in 1911. In that year he graduated from the U. S. Naval Academy of Annapolis after being captain of Navy's unbeaten 1910 football team. In World War I, he was commander of the submarine 0-6 and brought her through many tight squeezes. He later resigned his commission to enter the business world. After holding executive positions with several national organizations, he came to Whiting in 1939 and was vice-president in charge of sales until he left to rejoin the Navy shortly after Pearl Harbor.

Capt. Wright saw action in Saipan, Guam and other points in the Pacific and also was in charge of building the submarine base on Guam. He was commanding officer of the Sub Tender "Holland" for the last year and a half.

GUIDE TO WITCO PRODUCTS
Index
New...
"WITCO PRODUCTS" BOOKLET
gives complete and up-to-date information on WitcoCarbonBlack #11 and all other Witco products . . . conveniently arranged for ready reference. Write for your copy today.
"Developed especially for the paper industry"
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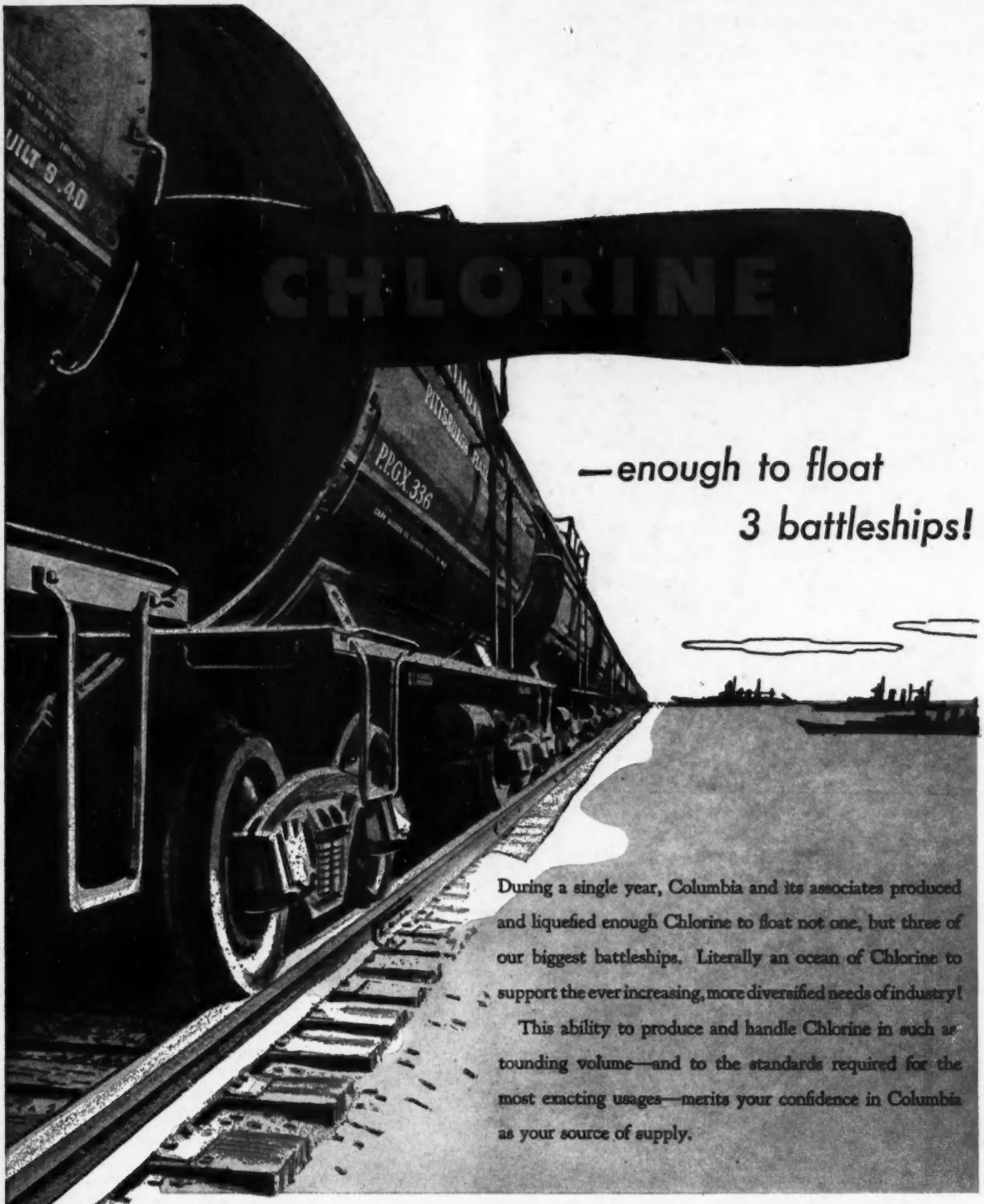
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During a single year, Columbia and its associates produced and liquefied enough Chlorine to float not one, but three of our biggest battleships. Literally an ocean of Chlorine to support the ever increasing, more diversified needs of industry!
This ability to produce and handle Chlorine in such astounding volume—and to the standards required for the most exacting usages—merits your confidence in Columbia as your source of supply.

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Papermaking in America

Scenes in the history and development of pulp and paper manufacturing in the United States are dramatically portrayed in an illustrated book published by the Bulkley, Dunton Organization, New York. Entitled "Papermaking in America," the handsomely bound, artistic volume is by Stephen Goerl and contains 22 full page scratch-board drawings by Robert Greco. It is a companion volume to "A Pictorial History of Paper," published last year by the same organization.

The illustrations, executed with consummate skill, depict historic scenes spanning a period of 255 years in the development of American papermaking which traces its origin to William Rittenhouse's first paper mill built in 1690 near Germantown, Penna. In selecting the themes for the illustrations, consideration was given more to the dramatic appeal and pictorial interest of the subjects rather than to economic or technical aspects. The historic scenes include George Washington's visit to a paper mill in New York, during which Washington made a sheet of paper with his own hands. Another picture dramatizes Benjamin Franklin's visit to the first colonial mill of Thomas Willcox. The founding of the Crane mill, oldest in the United States in continuous operation, is also shown.

Without attempting to give a complete history of the American pulp and paper industry's spectacular growth, "Papermaking in America" merely highlights some of the most interesting scenes and episodes in the long chain of events which eventually led the pulp and paper industry to take its place among the six major industries of our country.

It is stated in the preface of "Papermaking in America" that "every effort has been made to portray characters, buildings, equipment and surroundings as authentically as possible," and "deep gratitude is expressed to Dard Hunter, eminent paper historian and curator of the Paper Museum of the Massachusetts Institute of Technology, whose inspiration, counsel and assistance were invaluable in the conducting of research and in checking the authenticity of the material."

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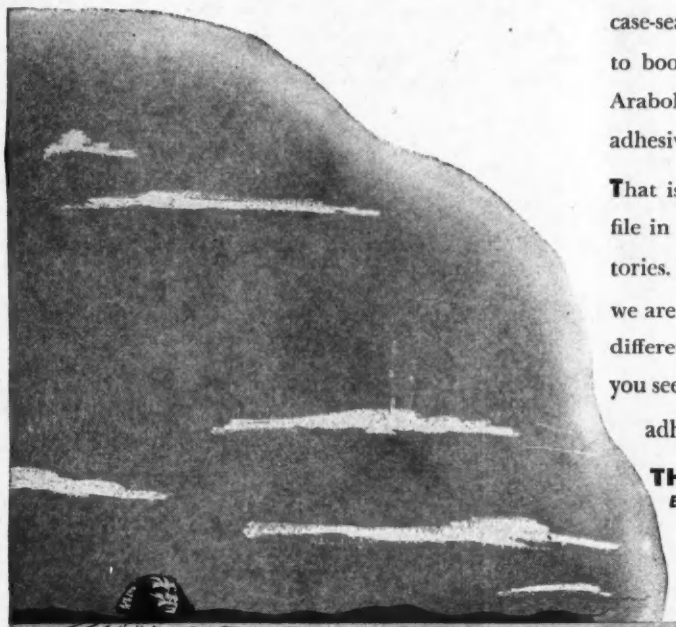
E-M Magnet Drive Responsive

Precise, wide - range, quick - response speed control for boiler draft fans, centrifugal pumps, blowers and compressors is provided by the new E-M Magnetic Adjustable-Speed Drive. Consisting of but two operating parts, a rotating ring and a rotating magnet, the Magnetic Drive is a compact, self-contained, electro magnetic torque transmitter used in combination with a constant speed a-c motor and an electronic controller to provide split-revolution speed control. The drive is made by the Electric Machinery Manufacturing Company, Minneapolis, Minn.

Built in ratings approximately 25 hp and larger at 1800 to 600 rpm, the Magnetic Drive is available in several forms to meet the requirements of new or existing installations. The Magnetic Adjustable-Speed Drive provides substantial power savings by operating boiler draft fans at reduced fan speed for partial fan output, eliminating the need for damper or inlet vane control. Life of induced draft fans operating in erosive gases is greatly increased due to use of reduced speeds at partial fan outputs.

The Magnetic Adjustable-Speed Drive can be used in combination with synchronous motors to provide power factor correction.

Serving the leaders in 100 industries



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That is why there are now 10,000 adhesives formulas on file in our New York, Chicago and San Francisco laboratories. That is quite surely why—as we enter our 61st year—we are able to cite our service to the leaders in a hundred different industries. It is also our reason for suggesting that you see the Arabol Representative when he calls; he knows adhesives!

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AFL Holds Zone Conferences

Delegates from local unions of the International Brotherhood of Pulp, Sulphite and Paper Mill Workers (AFL) in nine southern pulp and paper mills attended the Union's first zone conferences held recently in Jacksonville, Fla., and in Georgetown, S. C. Workers came to the conferences from International Paper Company, Southern Kraft Division, West Virginia Pulp and Paper Company, Union Bag and Paper Corporation, Rayonier Inc., Container Corporation of America, National Container Corporation, Brunswick Pulp and Paper Company, and St. Marys Kraft Corporation. Approximately 80 local union officers and delegates and International Representatives attended.

The conference agenda emphasized two major subjects: methods of securing greater economy and efficiency in the conduct of local union affairs and methods of promoting better relations with management. In addition, the general outlines of the Union's research and education program were presented and discussed.

On the conduct of local union affairs, panel discussions were arranged for dealing with local union finances, the work of the corresponding secretary, and the conduct of the local union meeting. Methods used in the different local unions and their problems in handling their work were discussed in order to promote an exchange of experience among the different locals and to encourage adoption of the more successful techniques. Numerous recommendations were made for consideration by the local unions and by the International Union.

In the sessions devoted to relations with management, Frank C. Barnes, International Treasurer of the Union, presented a statement on what the union expects of management. Among other things, he asked for fair dealing on the part of foremen, clear-cut qualifications for each job, clearly established lines of promotion, and trust and confidence in the local union.

Management's point of view was expressed in statements by W. T. Webster of the Brunswick Pulp and Paper Company (Jacksonville conference) and Frank Thompson of the West Virginia Pulp and Paper Company (Georgetown conference). The management representatives asked, among other things, for aid in enforcing mill rules, for prompt handling of grievances, and for a reasonable and cooperative spirit in administering the collective bargaining agreement. Both sides emphasized the importance of the attitudes with which each party to an agreement approached the collective bargaining relationship.

Reports of both conferences were prepared by the Union's Department of Research and Education and distributed to all delegates and International Representatives and to the Management representatives. Future Conferences are scheduled at Mobile, Ala., February 1, 2, and 3 and at Monroe, La., February 5, 6, and 7.

Strathmore Profits Off in 1945

SPRINGFIELD, Mass., January 5, 1946—Strathmore Paper Company reports for the year ended Oct. 31, 1945, a net profit of $198,585 after all charges including federal taxes of $140,000. This compares with net for the previous year of $221,803 after federal taxes of $155,000. Net sales for the year were $4,162,255, compared with $4,301,430 a year before.

Trees for Tomorrow Reports Its Work

MERRILL, Wis., January 7, 1946—A pictorial record of 1945 tree planting in one of the most highly concentrated reforestation centers in the nation—the six counties of the Upper Wisconsin River Valley—is shown in the twenty-four page booklet entitled "$4,000,000 Trees for Tomorrow", published by Trees for Tomorrow Inc.

Folke Becker, president of the Rhinelander Paper Company and president of Trees for Tomorrow Inc., in an article dealing with the new era in wood, states, "It is just good business to maintain a pace in forestry that matches the steady progress of science in our laboratories. Wisconsin's present and future forests will pay far greater dividends to all concerned if they are used wisely, protected, and renewed".

Good forestry practices are highlighted in articles by Galen Pike, area supervisor, U. S. Forest Service; F. B. Trenk, extension forester, University of Wisconsin; and Wakelin McNeel, state club leader, U. of Wis.

Forty-five photos range in subject matter from shots of tiny tots in the second grade planting their first trees, to the evenly spaced rows of a fifteen year old industrial pine plantation which will require thinning in three years' time. Photographs also show tension tests being made on high strength paper-base plastic, and the miniature paper making machine used in experimental work at Madison's Forest Products Laboratory.

Trees for Tomorrow Inc. is sponsored by the Wisconsin Valley paper industry.

Bryant Paper Promotes Fogerty

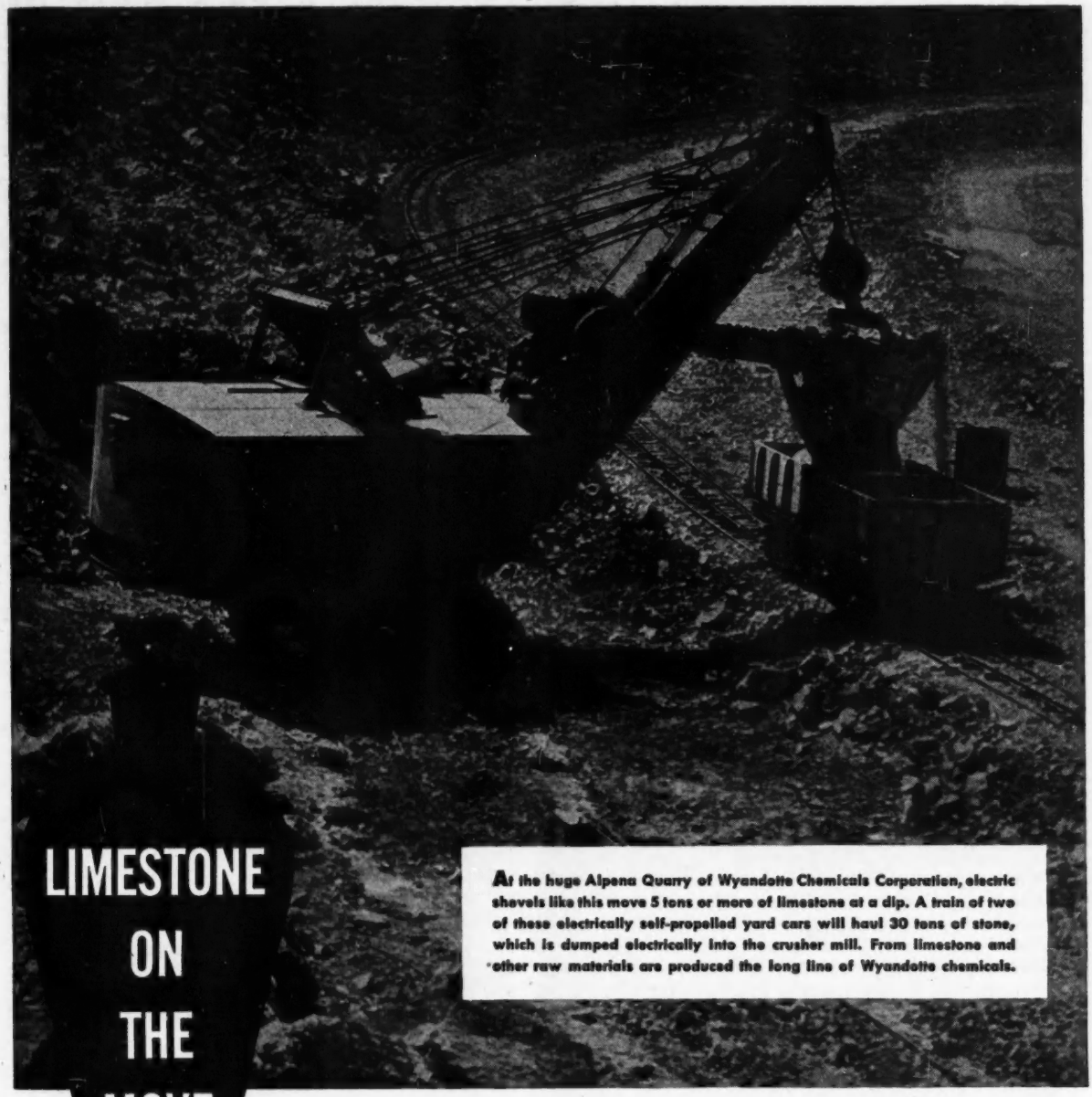
KALAMAZOO, Mich., January 7, 1946—It has just been announced by Allan B. Milham, president of the Bryant Paper Company, that Merton S. Fogerty was made vice-president in charge of engineering at the Board of Directors meeting held last Wednesday. Before coming to Bryant, Fogerty was chief engineer of the Michigan Paper Company, Plainwell, Mich. Prior to that he was Chief Engineer at the Groveton Paper Company, Groveton, N. H. Also Fogerty has been employed in the Engineering Departments of Abitibi Power and Paper Company, Ltd., Iroquois Falls, Ont., Kimberly Clark Corporation, Kimberly, Wis., and Bird & Son, East Walpole, Mass.

While in Kalamazoo, he has been very active in civic affairs. He is now president of the Kalamazoo Civic Players, and vestryman of St. Luke's Episcopal Church. He is past president of the Kalamazoo Rotary Club, and former acting commander of the American Legion Kalamazoo Post No. 332, and is also a past president of the chief engineers' club of the Kalamazoo Valley.

Bryant's new enlarged building program that is now well under way brings extra work and responsibility to Fogerty, who has been superintendent of Power and Maintenance since joining the company on December 19, 1944.

Condon Heads Specification Board

WASHINGTON, D. C., January 5, 1946—Dr. Edward U. Condon, Director of the National Bureau of Standards, has been appointed Chairman of the Federal Specifications Board. Dr. Condon succeeds Dr. Lyman J. Briggs, Director Emeritus of the National Bureau of Standards, who recently retired from the Government service.



LIMESTONE ON THE MOVE

At the huge Alpena Quarry of Wyandotte Chemicals Corporation, electric shovels like this move 5 tons or more of limestone at a dip. A train of two of these electrically self-propelled yard cars will haul 30 tons of stone, which is dumped electrically into the crusher mill. From limestone and other raw materials are produced the long line of Wyandotte chemicals.

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CANADIAN SITUATION TIGHT

(Continued from page 7)

been taken: Institution of a systematic survey of Crown lands; improvement of equipment for fire protection and suppression; establishment of an aerial patrol; encouragement of forest education, tree planting and a forest nursery; addition of a forest entomologist to the staff and advancement of plans for a forest biology laboratory; founding of additional game sanctuaries; provision for the appointment of district foresters and the establishment of a Maritime Ranger School; financial assistance to the Maritime Lumber Bureau; and plans to give effect to the studies and recommendations of the Nova Scotia Forest Products Association and other qualified organizations.

The Battle for Markets

Viewed in long-term perspective, the pulp and paper industry is expected to benefit from the fact that the federal Department of Trade and Commerce, in the background during the war years, is now in the forefront of all government departments, having undergone a reorganization and expansion that will give it a leading place in the battle of the market place and in the economy of the country.

The reorganization has been particularly directed to strengthening the foreign service. The old Commercial Intelligence Service has been recast into a streamlined Foreign Trade Service with six divisions, including an Export Division, an Import Division (believed to be the first of its kind), a Commercial Relations and Foreign Tariff Division, a Trade Publicity Division, and a Wheat and Grain Division. An executve committee, with the Deputy Minister as chairman, and the directors of divisions as members, meets regularly to discuss problems of organization and the work to be undertaken by the Foreign Trade Service.

A key man in this Foreign Trade Service is George R. Heasman, for four years an export expert with the Wayagamack Division of Consolidated Paper Corporation Limited. He has the title of Director of the Trade Commissioner Service and upon him falls the dual responsibility of gathering useful information about foreign markets from the Department's emissaries abroad and sending out and directing these salesmen. Mr. Heasman has been a Trade Commissioner in Middle Asia, South Africa, and the United Kingdom. During the war he was at the head of the export permit branch and his knowledge of foreign conditions made him invaluable as a senior executive of the Mutual Aid Board, the Canadian equivalent of Lend-Lease.

The Late J. E. Aldred

The papers here have been devoting a good deal of comment to the part played by the late J. E. Aldred, who died recently in the United States, in pioneer work in Canada in the hydro-electric and pulp and paper industries. Mr. Aldred was the founder and developer, and for many years president of the Shawinigan Water and Power Company, now one of the greatest hydro-electric concerns in the world, and among other things the basis on which has been built up the enormous pulp and paper industry of Quebec centering in the valley of the St. Maurice river. Mr. Aldred worked in close connection with the late Sir William Van Horne, the builder of the Canadian Pacific Railway, in founding industrial enterprises along the railway's lines in Quebec province. These enterprises included the former Laurentide Paper Company, the first of a long line of newsprint manufacturing concerns in the area served by the Shawinigan Water and Power Company. Mr. Aldred was a genius in mastering the many pioneering difficulties of numerous enterprises, both in the way of financing as well as engineering, and lived to see a region which was a wilderness when he came to it transformed into one of the most thriving industrial areas in Canada. It is agreed in the press here that his achievements represented the largest single contribution to the general industrial development of the province.

Commerce Dept. Opens Trade Office

WASHINGTON, D. C., January 7, 1946—Appointment of Arthur Paul as Assistant Secretary of Commerce, and establishment shortly afterward, of the new Office of International Trade, mark the opening moves of the long-pending Department of Commerce reorganization, as planned by Secretary Wallace. Merged in the new office are the functions and personnel of the Foreign Economic Administration, as well as some Bureau of Foreign and Domestic Commerce activities.

Other personnel named in the shake-up are James L. McCamy, assistant to Mr. Paul, who will have charge of foreign trade policy, assisted in turn by Herbert W. Parisius; George L. Bell, director of Foreign Trade Promotion, assisted by William M. Friedlander; H. B. McCoy, international commodity problems, which he formerly handled in the Bureau of Foreign and Domestic Commerce, and E. E. Schnellbacher, also of that Bureau, who will continue in the new set-up, as dissemination of commercial and economic information. Others named include Murray Marker, Office of War Areas trade, Dr. Lewis L. Lorwin, economic advisor and Nathan Ostroff, general counsel.

Obituary

James Robert Woodside

GLENS FALLS, N. Y., January 4, 1946—James Robert Woodside, night superintendent of the Hudson River Mill of the International Paper Company, Corinth, N. Y., died December 31, 1945 at the Glens Falls Hospital, at the age of 58, after a sudden illness. He was born at Frankfort, New York. Mr. Woodside had been engaged in paper making all of his life, having a varied and intensive experience in it before coming with the International Paper Company, 24 years ago. He enjoyed a wide acquaintanceship with the old timer sof the Trade.

He was a member of Corinth Lodge 987, F. & A. M. His survivors include his wife, Mrs. Margaret Woodside; three sons, Vernon, of Niagara Falls, New York; Laurence, of Albany, and Franklin, of Corinth, a daughter, Mrs. S. M. Hesser, of Corinth, and six grandchildren. Interment was at Corinth.

W. J. Quinlan

WARRENSBURG, N. Y., January 7, 1946—William J. Quinlan, 69 years old, for many years superintendent of the former Schreon River Pulp and Paper Company, died last week at his home here after an extended illness. He retired several years ago. He was a member of the Glens Falls Lodge of Elks. Principal survivors are his wife, two daughters and a son.

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IN PAINT Titanox-A gives opacity, promotes brightness, resists fading and adds durability to coatings for both interior and exterior use. IN PAPER Titanox A imparts the important qualities of opacity, brightness and printability, and is easy to handle because of its ready dispersion quality. IN RUBBER Titanox-A supplies a high degree of whiteness, develops resistance to abrasion and sun discoloration. IN INKS Titanox-A assures greater color stability and opacity.
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In 1925, Titanox-A (Titanium Dioxide) was developed at Niagara Falls, New York, as a result of research by the staff of The Titanium Pigment Company, Inc. This was the first pure titanium dioxide pigment commercially produced in the United States... another "TITANIUM PIGMENT FIRST".

This new product was superior to any other Titanium pigment available up until that time and even approached present-day Titanox-A in opacity, whiteness and brightness. These improved characteristics make versatile Titanox-A the preferred pigment for a great variety of uses.

While keeping quality uniformly high, the makers of Titanox pigments are also exerting every effort toward increasing output to meet a tremendously expanded industrial need.

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PAPER
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W. L. Cook, Editor

WAGES AND EMPLOYMENT

Labor difficulties resulting in strikes in which all are adversely affected, reflect primarily the desire to obtain a larger share in the profits of production than accrues from the annual earnings provided by existing general scales of wage payments. It appears also, that the only logical and equitable consideration of employee earnings must eventually be based upon annual income rather than on the rate of day or weekly wages. Steady work for every work day in the year is the prime consideration of every capable worker. Some fair profit-sharing plan appears the only simple and satisfactory method of providing a larger income for workers and at the same time insuring their loyalty and full cooperation which will prevent work stoppages arising from labor disputes.

In considering the question of employment and the worker's welfare only in the paper and pulp industry, we find that work in paper mills is notably steady and has been so over a long period of years. In comparison with twenty-one industries, paper and pulp affords the best opportunity for steady work. In other words, the seasonal change in employment in paper and pulp may be stated at 3.4%, while in the next most stable of the twenty industries now considered, electrical manufacturing, the change is a little under 4%. Paint and varnish, hosiery and knit goods, paper converting, boot and shoe, chemical, silk, furniture and machine shops, printing, book and job, agricultural implements, printing, book and magazines, iron and steel, lumber and mill work, meat packing, wool, are all progressively greater, and the automotive industry with a change of 26.9% is the highest on the list of twenty great industries, and the one affording its workers the least steady employment. With a seasonal change in employment so high as 26.9%, dissatisfaction of the workers in this industry is better understood and it may explain, in part at least, why workers in automotive plants are so vigorously striving to obtain a larger annual income by demanding a 30% wage increase.

Comparative data of the steady work provided its workers in the paper and pulp industry, collected by the National Conference Board, show that, from 1932 to 1942 inclusive, paper and pulp more actively employed its workers. Taking 1923 as 100, employment in paper and pulp in 1932 rater 83.5; in 1933, 88.9; in 1934, 103.4, and in 1942, 123.8. The average of these eleven years was 107.8. In all manufacturing data, including the automobile industry, of which data is not available in 1942 and 1943, an employment averafe of 116.4 was shown. This data indicates that employment in the paper industry is very stable in comparison with other major industries, and the showing is particularly good in the depression years.

In a study made last year within the paper industry, it was indicated that, taking the average month of 1935 as 100, the labor cost per ton of paper for one month, May, varied according to the daily capacity of the mills studied; being highest at $59.25 per ton in mills with a daily capacity up to 10 tons; and lowest in mills with a capacity of 200 tons or more, at $13.20 per ton; the average labor cost of the mills included in the study was $16.65 per ton. These figures indicate that mills with large output operate at lower costs; that as larger machines are introduced and higher production is attained on existing machines, the average labor cost per ton of paper would decrease. Labor costs are, of course, only one of the important elements in total cost of production, as raw materials, manufacturing expense and sales expense are other essential elements.

Labor Costs and Profits

In a study of labor costs and profits conducted by the American Paper and Pulp Association late last year, it was indicated that wage rates advanced considerably between January and October 1941. Taking January, 1941 as 100, the average hourly base pay increased to 132.6 in the paper and pulp industry through September, 1945. On the same basis, the cost of living rose to 128.9, which indicates that in the paper industry wages rose almost 4% more than the cost of living.

In relation to output per worker, the study shows that it requires 3.9% more man hours to produce a ton of paper than it required in 1941. This increase in man hours, the analysis states, may in part be due to the production of lighter weights and higher grade papers, and in part to less efficient labor. But at no time since October, 1941, has it taken less man hours per ton than it did in 1941.

During the period under study, the average hourly wages have increased steadily, due to two factors; the increase in hourly base wage rates, and increases in the average weekly hours of employment. Hourly base wage rates have increased 23.1%, while average weekly hours of work have increased 3.2%. These two factors, through the operation of the rule that time worked more than forty hours per week will be paid for at time and one-half rates, have resulted in an increase of 46.7% in the average weekly wage; and it should be noted that the "time and one-half" rule also operates to increase the average hourly wages paid. The average labor cost per ton or unit labor cost is derived by multiplying the average man hours per ton by the average hourly wage rates. Both of these factors have increased, the one because of lower productivity and the other because of increases in hourly base rates and in the length of the work week. The resulting increase of 38.5% in unit labor costs is one important reason for the decline in profits.

Northeastern Council Meets Feb. 14

BOSTON, Mass., January 7, 1946—The next quarterly meeting of the Northeastern Wood Utilization Council will be held February 14, at the Hotel Lennox. The main topic of discussion will be "Extractives and Essential Oils from Northeastern Woods". Among the speakers scheduled are: Mr. Percy C. Magnus, president of Magnus, Mabee & Reynard, Inc., N. Y.; Dr. Ernest Guenther, Vice-President and Director of Research of Fritzsche Bros. Inc.; Dr. E. V. Lynn of the Massachusetts State College of Pharmacy, Dr. Robert S. Aries, Field Director of the Northeastern Wood Utilization Council and Research Associate of the Polytechnic Institute.

Among the topics to be considered will be the availability, recovery and economics of essential oils from Northeastern woods, with respect to other parts of the country or foreign lands. Attendance at the meeting will be by invitation, only,—further details may be secured by contacting Mr. Edgar L. Heermance, Secty., of the Council, P. O. Box 1577, New Haven 6, Conn.

Southern Conservation Meet Jan. 31

ATLANTA, Ga., January 7, 1946—The annual meeting of the Southern Pulpwood Conservation Association will be held in the Atlanta Biltmore hotel, January 31 and February 1. The first day's meeting will start at 9:00 A.M. and will be devoted to a discussion of the conservation program. It will include a brief resume of accomplishments and suggestions by public and industry foresters leading toward improvement of forest practices. The morning of the second day will be devoted to a discussion of mechanization and logging methods studies as they apply to the pulpwood industry. The afternoon of the second day will be set aside for a business session for members of the Association.

Production Ratio Report*

(Production as per cent of six-day capacity)

COMPARATIVE WEEKLY SUMMARIES

Current Weeks—1945		Corresponding Weeks—1944	
Nov. 24	91.4	Nov. 25	87.2
Dec. 1	97.5	Dec. 2	91.0
Dec. 8	99.0	Dec. 9	93.7
Dec. 15	99.0	Dec. 16	89.3
Dec. 22 (Revised)	96.5	Dec. 23	84.6
Dec. 29	*58.2*	Dec. 30	62.0

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1944	88.7	88.5	88.1	87.6	88.7	89.8	80.3	90.6	88.2	92.5	90.6	92.4	88.1
1945	86.7	89.4	90.2	88.1	89.8	91.2	80.8	88.6	90.2	95.9	95.5	*91.0*	89.7

COMPARATIVE YEARLY SUMMARIES

	1938	1939	1940	1941	1942	1943	1944	1945
Year to Date	71.5	83.4	85.6	97.4	90.4	87.8	88.1	89.7
Year Average	71.5	83.4	85.6	97.4	90.4	87.8	88.1	*89.7*

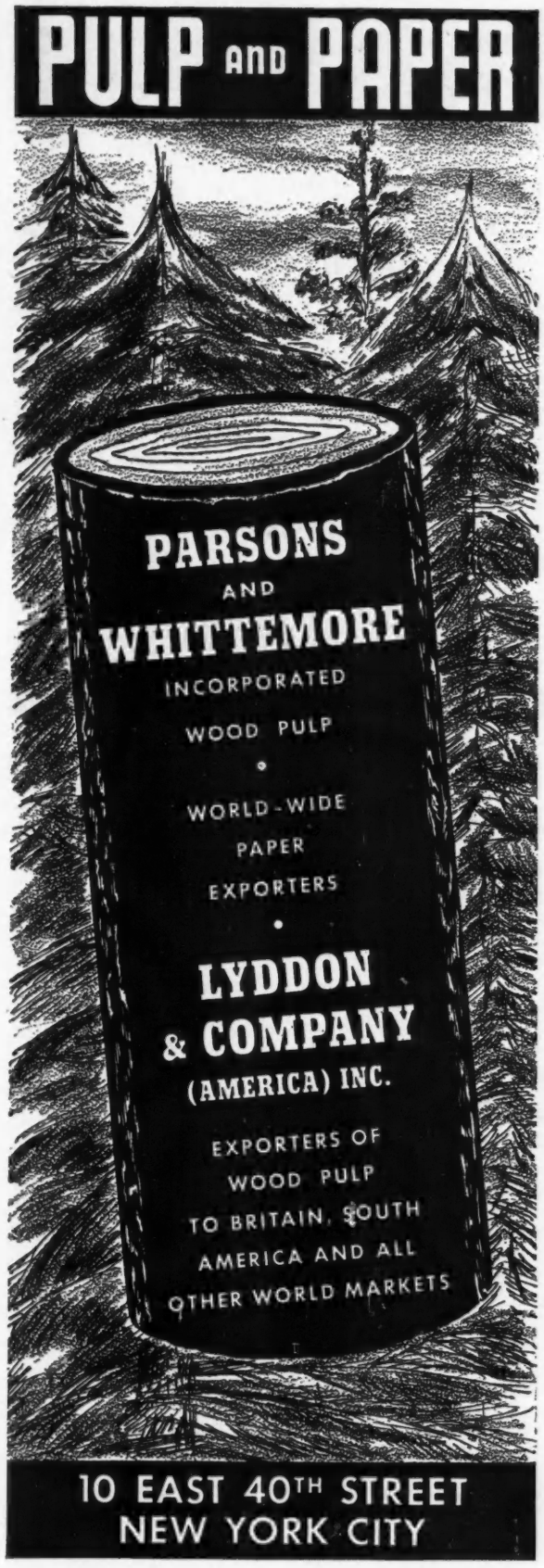
* Based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

PAPERBOARD OPERATING RATIOS†

Current Weeks—1945		Corresponding Weeks—1944	
Nov. 24	91	Nov. 25	91
Dec. 1	96	Dec. 2	94
Dec. 8	97	Dec. 9	95
Dec. 15	98	Dec. 16	94
Dec. 22	92	Dec. 23	94
Dec. 29	*52*	Dec. 30	57

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.	Year Avg.
1944	90	96	95	96	96	96	85	96	92	95	95	85	93
1945	91	95	97	97	96	96	86	90	91	97	95	*85*	93

† Per cents of operation based on "Inch-Hours" reported to the National Paperboard Assn.



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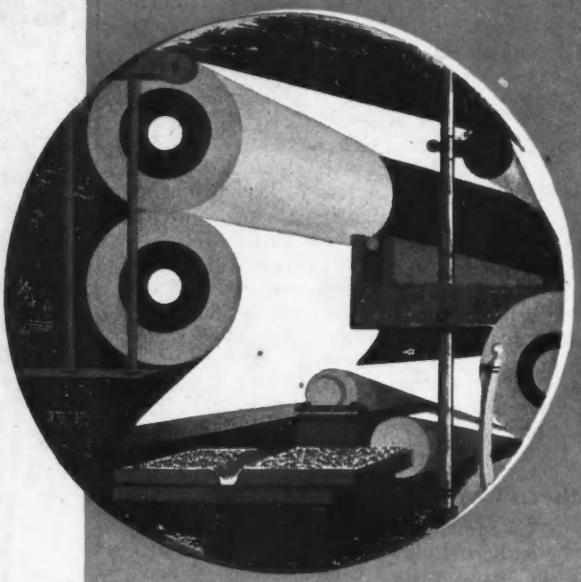
mold is generally all wet!



HOW DOW FIGHTS MOLD ATTACKS

Water—indispensable to man—nevertheless causes many manufacturing headaches. Under certain conditions, it encourages the growth of mold—destructive mold that constantly harasses production in many industries.

In one step of paper making, for example, the wet pulp mass that eventually becomes finished paper is carried on felt belts and squeezed partially dry between rollers. Being subjected to constant dampness, the felt is up against continual mold attack.

Dow research men tackled the problem and came up with Dowicide—a germicide and fungicide that increases wet felt life as much as forty to sixty per cent. Paper manufacturing has benefited immeasurably.

Furthermore, Dowicide products have helped paper producers combat other mold attacks . . . they have aided in slime control, in preserving log and pulp stock, in making packaging papers mold resistant, in reducing maintenance costs.

Similar mold problems in the textile, lumber, paint, and other industries are being successfully reduced by a Dowicide specifically designed for the job. If you are bothered by molds, fungi, bacteria, or termites, write us to find out how Dowicide can help you.

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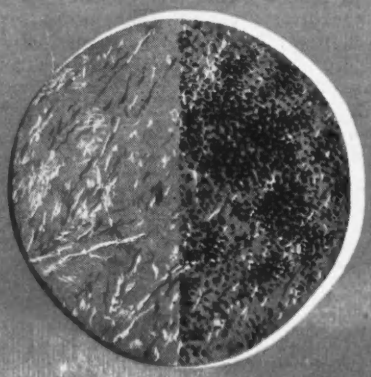

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Chlorite Holocellulose, Its Fractionation and Bearing on Summative Wood Analysis and on Studies on the Hemicelluloses*

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Abstract

A critical review is given of the methods used in the isolation of holocellulose from wood. Special emphasis is placed on experiments simplifying and otherwise modifying the sodium chlorite procedure of Jayme. In the case of conifers, the holocellulose obtained by treatment with acetic acid and sodium chlorite could be separated into hemicellulose fractions and alpha-cellulose. These techniques are fully described. The sum of the percentages of ash, acetyl, extractives, lignin, the hemicelluloses, and alpha-cellulose in a coniferous wood accounts for 98 to 102% of the original wood sample. Summations within this range are considered entirely satisfactory. When applied to hardwoods, the summations appear to be somewhat less satisfactory. Orienting studies on spruce, redwood, Douglas fir, and aspen are reported and more comprehensive data are given for ponderosa pine, which serves to exemplify analyses of other coniferous woods. In the case of ponderosa pine, summative analyses were also made by determining ash, extractives, alpha-cellulose (corrected for its various components), mannan, xylan, uronic anhydride, lignin, and acetyl groups. The two sets of summations are in substantial agreement. Besides the species mentioned, the Institute has made analytical studies of western hemlock, loblolly pine, western red cedar, several species of oaks, and several varieties of sugar cane, using in all cases the chlorite procedure. These data are reserved for future publication. The errors inherent in all types of summative wood analyses are discussed and special reference is made to possible balanced errors, which may have accounted for the apparent precision of such analyses in the past.

The chief value of the chlorite method for holocellulose, however, is that of a research tool. Large scale preparations can be made easily within very short time periods with the minimum of manipulation. Such preparations (because of the mild action of chlorine dioxide) can serve in the further study of alpha-cellulose fractions, hemicelluloses, and pectic materials. They may also prove valuable in researches on the degree of polymerization of the various carbohydrate fractions. When unbleached pulps are chlorited, they give raw materials from which residual hemicelluloses may also be removed quantitatively and studied.

Within the past quarter century, three classical procedures have been developed for the quantitative isolation of the carbohydrates from cell walls of extracted wood. The oldest is that of Erich Schmidt and his co-workers *(1, 2)* for the separation of the so-called "skeletal substances." After undergoing a series of evolutions, during the course of 10 years, Schmidt's method finally involved the use of chlorine dioxide in pyridine and water; it required a long time period for quantitative delignification. Despite its impracticality for routine analysis, Schmidt deserves the highest praise for using a new (and at that time dangerous) reagent which had practically no effect on the carbohydrates. He was the first to isolate quantitatively both the cellulose and the hemicelluloses of extractive-free wood.

In 1933 Ritter and Kurth *(3)* of the Forest Products Laboratory devised a method for isolating the total carbohydrate fraction by using repeated alternate treatments of extractive-free wood with chlorine and a solution of pyridine in ethanol, followed finally by treatment with a cold calcium hypochlorite solution, until the residue was white and free from lignin. When this method was applied to extracted maplewood containing 22.8% lignin, Ritter and Kurth obtained, within 10 hours, 76.2% of a lignin-free carbohydrate fraction which they christened "holocellulose." By this method they accounted for 99% of the entire wood substance. The same authors also ran a control analysis, using Schmidt's more cumbersome chlorine dioxide technique. In this case they isolated 75.8% of the skeletal substances of the wood, thus obtaining an excellent confirmation of their own work. When the holocellulose was compared analytically with the skeletal substance fraction, the two showed surprisingly close agreement. Both accounted for over 96% of the pentosan of the original wood, both retained all the acetyl groups, and the holocellulose fraction contained practically all the carbon dioxide-forming material originally present in the

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wood, whereas the skeletal substances retained over 87% of these same groups.

When Kurth and Ritter *(4)* attempted to apply their original technique to the analysis of sprucewood, losses were encountered, and the method underwent further modification. The concentration of pyridine was increased from 15 to 50% and the bleach treatment was eliminated completely. Later Van Beckum and Ritter *(5)* devised a modified procedure which shortened the time of isolation and which has been accepted by TAPPI as a tentative standard. The solvent chosen to remove chlorolignin was a 3% alcoholic ethanolamine solution, and alternate chlorinations and extractions were made at 75°C. until the residue remained uncolored on further treatment with the ethanolamine solution. The sample was then washed with alcohol, cold water, alcohol until neutral to litmus, and finally with ether. Inasmuch as the presence of water is required in the delignification, and because aqueous ethanolamine had a solvent action on certain carbohydrates, it was necessary to remove water from the sample with alcohol before each alcoholic ethanolamine extraction was made. The residual extraction liquor also had to be removed with alcohol before each subsequent chlorination. These points are stressed in the light of a subsequent critical discussion of the Forest Products Laboratory method. With their technique, Van Beckum and Ritter obtained results on a series of extracted softwoods and hardwoods, in which the summative analyses (lignin plus holocellulose) ranged from 99.5 to 100.3%. Freeman and Peterson *(6)* applied Ritter's earlier (pyridine) technique to six American hardwoods and obtained summative analyses of ash, extractives, lignin, and holocellulose which ranged from 99.3 to 101% of the weight of the unextracted wood. Similar (unpublished) results were obtained by Thomas *(7)* with extracted aspenwood from which he isolated holocellulose by a modification of Ritter's holocellulose method *(8)*. In this case the aspen wood contained 18.9% lignin and 80.7% holocellulose —a summation of 99.6%. Anderson *(9)* applied the holocellulose method to various western pines. The summation of ash, extractives, lignin, and holocellulose totaled 99.9 to 100.9%. These are all remarkable confirmations of Ritter's method for holocellulose and, inasmuch as they were obtained in four different laboratories with different wood species, they argue in favor of proximate analyses the precision of which is of an unusually high order.

In unpublished data obtained by Atchison *(10)*, using extracted black sprucewood containing originally 27.3% lignin, 73.2% of holocellulose was obtained by Ritter's method. The lignin content of the latter was 0.18%; thus, the corrected value for holocellulose was 73% and the summative analysis totaled 100.4%. ***However, it was found that the holocellulose retained 0.43% nitrogen, which might indicate an ethanolamine retention of 1.86%.*** Unfortunately, no nitrogen determination was made on the original sprucewood sample used by Atchison but subsequent analyses of composite sprucewood meals showed only about 0.08% nitrogen. Inasmuch as the nitrogen content of domestic softwoods is in general below 0.12%, it is fair to assume that the nitrogen retention in spruce holocellulose is over and above the nitrogen content of the wood itself.

When Atchison experimented with a sample of holocellulose which retained 1.9% lignin (by the Klason sulphuric acid method), he found that, if he computed the holocellulose lignin "by difference" [i.e., by subtracting the theoretical yield of holocellulose (72.7%) from the percentage of (lignin-containing) holocellulose actually found (76.9%) and then dividing this difference by the latter and multiplying by 100], this "lignin by difference" figure was 5.4%. The particular sample of holocellulose actually retained 0.77% nitrogen, an ethanolamine equivalent of 3.36%. This value was very close to that found by simply subtracting the "lignin as isolated" (1.9) from the "lignin by difference" (5.4)—i.e., 3.5%. From Atchison's data, it would appear that nitrogenous material (presumably ethanolamine) was held tenaciously by the holocellulose. This might be due to ethanolamine in combination with lignin not determinable by the Klason method or combined with uronic acid carboxyl groups in the holocellulose. Atchison found that, even when his purest holocellulose preparation (i.e., the one retaining 0.43% nitrogen) was extracted for 1 hour with hot water, about 50% of the nitrogen was still retained. Possibly a part of this nitrogen was due to protoplasmic protein, but this would hardly account for the relatively high amounts.

Another pertinent finding by Thomas *(7)*, in his experiments with aspen, was the fact that, despite his ability to account for 99.6% of the wood, 7% of the pentosans of the original wood were lost during the isolation of the holocellulose. This was confirmed by other data and would actually indicate a loss of about 1.4% of the wood, which must have been largely compensated for by a corresponding gain from some other source. Furthermore, Thomas *(8)* found that, whereas his extracted aspenwood contained 0.15% nitrogen, his holocellulose contained 0.57% nitrogen, which, on the oven-dry, extracted wood basis, was 0.44%, *an increase of nearly 0.3%*. Evidently nitrogenous material had been sorbed during the holocellulose isolation.

The present writers have confirmed the findings of both Atchison and Thomas to the effect that there is more nitrogen present in the holocellulose than was present in the original wood. Evidence will be found in the experimental part of this paper.

Thus, the conclusion must be reached that the apparent precision of the summative wood analyses given in the literature is largely fortuitous and is due to a neat balancing of slight experimental errors. Small amounts of carbohydrate material are lost and correspondingly small amounts of ethanolamine are retained, thus leading to summations that appear to account for the entire wood substance. This criticism should not be taken as a disparagement of the excellent work of Ritter and his co-workers at Madison. Their holocellulose method remains classical, and the errors involved are usually slight. But, inasmuch as the data give assurance of an unwarranted precision in the proximate analysis of wood, they are open to scrutiny and criticism.

The most recent technique for determining holocellulose in wood is that described by Jayme *(11)*. He extracted microtome sections of wood (40 to 80 mu in thickness) with methanol-benzene, and then delignified them at a stock density of 3% with 30 parts of sodium chlorite and 6 parts of acetic acid (based on oven-dry wood). The chlorite treatment was carried out at 60° C. for 12 hours. The residue was then filtered and washed, and subjected to three more successive chloritings for 12, 8, and 8 hours each. After each treatment, the wood residue was again filtered and washed. The final white residue still retained 2.8 to 3.5% of lignin, and Jayme found that, if this was removed by more drastic action, car-

bohydrate material was lost simultaneously. Therefore, Jayme insisted on leaving this small amount of tenaciously held lignin in his holocellulose, and correcting for it in his quantitative determinations. When this was done, his summative analyses of wood were nearly perfect. In a spruce sample containing 28.24% lignin, Jayme found 71.80% holocellulose. In a beechwood containing 21.75% lignin, he found 78.28% holocellulose.

The Jayme procedure, because of its simplicity and because of the very mild action of chlorine dioxide on cellulose, was studied intensively at The Institute of Paper Chemistry. A brief preliminary communication was published in January, 1945 *(12)*, showing its usefulness, especially in modified form. Since then other marked improvements have been made, which will be discussed in the experimental part of this paper. These modifications have been used in comprehensive studies on the chemical composition of wood and related plant tissues. Our objectives, however, were quite different from those of Jayme. Instead of isolating holocellulose itself and weighing this fraction, it was generally used for separating quantitatively hemicellulose fractions and alpha-cellulose. This was done by carefully controlled extractions with aqueous potassium hydroxide. A summation of these hemicelluloses, alpha-cellulose, extractives, ash, lignin, and acetyl content (determined on the extracted wood) compared well with those found by other investigators. Usually it accounted for 98 to 102% of the wood. The modified technique also permitted a qualitative and quantitative study of the hemicellulose and alpha-cellulose fractions and, when large samples were used, in the rapid preparation of large samples of holocellulose, not only for the study of the hemicelluloses but also for the isolation of pectic materials *(13)*. Thus, chlorite holocellulose has become an excellent raw material for the research worker. Our work in the main substantiated that of Jayme. However, it was found unnecessary to use the prolonged chlorite treatments described by Jayme, nor was it necessary to filter the wood residue after each treatment. In general, the chloritings could be completed within 4 hours. Frequently, preliminary extraction of the wood was unnecessary, although this was not always the case. Wood meal (in place of microtome sections) could also be used effectively. One important point made by Jayme could not be substantiated. It was not found possible to subject extracted wood to the chlorite treatment and then simply correct for retained lignin. As an example, in the case of extractive-free aspenwood, it was found that the holocellulose produced by chloriting yielded appreciable amounts of alcohol-soluble material. Only after these were extracted could a satisfactory lignin determination be made and used in correcting the holocellulose values. When this was done (and the ash determined as well), a summation of corrected holocellulose and lignin accounted approximately for the entire wood substance (100 to 102%). Jayme's insistence that the tenacious lignin be left in the holocellulose was found to be entirely justified. Complete removal of lignin caused a marked loss of hemicellulose.

This has been confirmed indirectly by the interesting work of Lovell *(13a)*, who prepared fibrous holocelluloses by the delignification of western hemlock and slash pine chips by a series of chlorite treatments followed by hot water extractions. Whereas the holocellulose content of the original hemlock wood, as determined by Ritter's method, was 69%, the yield of chlorite holocellulose fiber was only 64%. Evidently the more soluble polysaccharides of the cell wall had been leached out. Presumably this was due not only to the inherent solubility of these substances in hot water, but to the removal of lignin, which must have been nearly complete as a result of the drastic conditions of the delignification.

In extracting the chlorite holocellulose, potassium hydroxide was used in place of sodium hydroxide because of the greater solubility of potassium acetate in alcohol. After a series of orienting experiments, it became clear that any concentration of alkali used in removing hemicelluloses would be largely arbitrary. However it was found expedient to use 5% and 24% potassium hydroxide—the latter because it serves to extract most of the cellulosans from the holocellulose, and because further extraction (with stronger alkali) removes very little more carbohydrate material. However, it should be emphasized that the term "alpha-cellulose." which has been used to designate the residue after alkaline extractions, is also arbitrary. It is valuable for comparative purposes, but it does not mean that we are dealing with a homogeneous anhydroglucose residue identical with that of cotton cellulose. Invariably this residue contains small amounts of carbon dioxide- and furfural-yielding material and, in the case of the softwoods, significant amounts of mannose-yielding components. However, it indicates analytically the *largest amount* of alkali-resistant material that may be expected from an individual wood. In the alkaline extractions, certain precautions were maintained. The extractions, so as to be reproducible, were carried out for definite time periods at a definite temperature. Another precaution was the use of nitrogen during the extraction, so as to mitigate oxidation.

No claim is made that our summative analyses are more precise than those previously determined. In general, they account for 98 to 102% of the wood in the case of the coniferous woods. The summation is not quite as satisfactory with hardwoods. The chief value of the holocellulose technique lies in its simplicity, in the speed with which it can be effected, and in the fact that large samples can be prepared as easily as small ones.

Orienting Experiments

Preliminary work on the delignification of wood by means of acid chlorite solutions was first undertaken in 1941 at the New York State College of Forestry at Syracuse, New York. The fragmentary results, which showed that wood meal could be almost completely delignified, remained unpublished. Later, following the publications of Jayme *(11)* in this same field, work was resumed at The Institute of Paper Chemistry *(12)*. It was shown that 10-gram samples of unextracted coniferous wood meals, when heated to 60° C. and allowed to stand at 30° for about 24 hours with 500 ml. of an aqueous solution of 50 grams of sodium chlorite and 50 ml. of acetic acid, were largely delignified. The resultant impure holocellulose could then be fractionated by means of caustic potash into various hemicellulose fractions and alpha-cellulose. The effort of varying the concentration of alkali is discussed in another section. The results obtained, together with analytical data on the percentage of lignin, extractives, and acetyl, led to summative analyses of a somewhat new type, and also permitted a further study of the hemicellulose fractions themselves. The reagents caused little degradation of the wood polysaccharides, and the tech-

nique was simple, reproducible, and fairly rapid. The method, in its preliminary form, was applied to redwood, Douglas fir, and black spruce and the analytical data are given in Table I. Only in the case of spruce, was a second (1 hour) chlorite treatment resorted to. Inasmuch as these orientating experiments have been described adequately in another paper *(12)*, details are omitted here. In these earlier summations, the small amount of ash present in the wood samples was ignored, but it was evident that the other principal components were accounted for.

TABLE I.—SUMMATIVE ANALYSES OF CONIFEROUS WOOD

	Redwood, %	Douglas Fir, %	Black Spruce, %
Lignin [a]	31.30	25.80	27.3
Alcohol extract [a]	21.83	4.20	3.5 [b]
Water extract on residue from alcohol extraction	1.80	3.20	
Alpha-cellulose (corrected for ash and lignin)	35.75	50.09	49.7
Hemicellulose (corrected for ash)	9.63	15.10	18.0
Acetyl [a]	0.28	0.76	1.16
Total	100.59	99.15	99.66

[a] Determinations by the Analytical Group of the Institute.
[b] Summation of the two extracts.

When the chlorite method was applied to extracted and unextracted hardwoods, the results were less satisfactory, as shown by the following experiments with aspen. In Table II, data are given for experiments in which varying amounts of chlorite were permitted to react with extracted aspenwood for about 24 hours. The hemicellulose fractions were extracted as usual (under nitrogen) with alkali, and the hemicellulose content was determined. The lignin values are those found by Thomas *(8)* and the acetyl values refer to those of the extracted wood.

TABLE II.—ANALYSES OF EXTRACTIVE-FREE ASPEN

Experiment	III	IV	V	VI	VII
Chlorite per 5 g. of aspenwood, g.	25	25	15	10	5.0
Lignin, %	18.90	18.90	18.90	18.90	18.90
Alpha-cellulose (corrected for lignin and ash), %	51.57	51.91	52.06	52.25	52.92
Hemicellulose A (corrected for ash), %	15.98	16.03	16.31	17.17	16.16
Hemicellulose B (corrected for ash), %	5.85	5.92	5.38	5.38	5.60
Acetyl, %	3.63	3.63	3.63	3.63	3.63
Total	95.93	96.39	96.28	97.23	97.21

The fraction termed "Hemicellulose A" is that which was extracted with 4 to 5% potassium hydroxide; "Hemicellulose B" was removed from the residue (from A) by means of 24% potassium hydroxide. In either case, the extractions were carried out under nitrogen and the extracts were filtered, the residues washed with alkali and water, and hemicelluloses precipitated by means of acetic acid and ethanol, centrifuged, washed with alcohol and ether, dried, and weighed. In the light of Anderson's experiments *(13)*, these hemicellulose fractions must have retained small amounts of pectic materials but, in the present communication, no attempt has been made to differentiate between these and the hemicelluloses.

It is evident that some losses occur in this isolation, irrespective of the chlorite/wood ratio, and these have not been fully explained.* Even when unextracted aspenwood was used, the summative analyses lacked the accuracy obtained with the softwood, although the trend showed some improvement over extracted wood, as indicated in Table III.

TABLE III.—ANALYSES OF UNEXTRACTED ASPEN

	I	II
Total extractives, %	4.3	4.3
Lignin, %	18.1	18.1
Acetyl, %	3.4	3.4
Alpha-cellulose, %	51.4	51.1
Hemicellulose (A plus B), %	20.7	21.6
Total	97.9	98.5

In an attempt to discover whether hemicellulose losses occurred in the original chlorite treatment or during subsequent extractions, the following experiments were set up: Ten grams of air-dried extracted aspenwood (9.225 grams oven-dry) in each case received the usual treatment with 50 grams of sodium chlorite and 50 ml. of acetic acid. The crude holocelluloses were filtered and washed with ice water. When dry, the residues were shown to be partly soluble in hot alcohol, and the alcohol extract gave a typical Maüle reaction. The results are given in Table IV (A and B). In this same table (under C and D) are given results carried out with 5-gram samples of airdried extractive-free aspen (4.655 grams oven-dry) which were treated at about 70° C. with 150 ml. of water containing 1.5 grams of sodium chlorite and 3 ml. of acetic acid for 1.5 hours in loosely stoppered Erlenmeyer flasks. The residues were then filtered and washed and the treatment repeated for 2.5 hours (using 0.3 ml. of acetic acid, 150 ml. of water, and 1.5 grams of sodium chlorite). Subsequently, the white fibrous residues were filtered, washed successively with cold water, hot alcohol, and cold water, and dried. The dry holocellulose was then exhaustively extracted with boiling ethanol, washed with water, dried, and analyzed, and corrected for Klason lignin and ash. The summative analyses, in all cases, are those of lignin (on the extracted aspen) and corrected holocellulose.

The data in Table IV show that the crude holocellulose contains material (other than ash or lignin) which is soluble in alcohol. It is evident that a simple lignin determination made on the crude holocellulose, as suggested by Jayme, cannot be used to give corrected holocellulose values in the case of the present procedure. The data suggest that hemicellulose losses are probably inappreciable during the chloriting procedure. Where the hemicellulose losses actually occur is still indeterminate at present.* Very similar results have been obtained with other hardwoods.

TABLE IV.

	A	B	C	D
Crude (o.d.) yield, g.	8.552	8.515	3.960	4.072
Loss on alcoholic extraction, %	5.0	6.11	1.9	2.3
Total lignin in residue (after alcohol extraction), %	3.14	2.86	1.9	2.75
Total ash (after extraction), %	1.66	1.33	0.76	0.83
Holocellulose (corrected for lignin, ash, and extractives), %	83.5	82.8	81.2	82.3
Summative analysis (using 18.9% lignin as determined by Thomas), %	102.4	101.7	100.1	101.2

* That these losses may depend in part on methods of correcting for ash in the hemicelluloses is discussed later.

It might appear that Jayme's protracted chloriting procedures (40 hours) *(11)* successfully removed *all* alcohol-soluble matter from the holocellulose. This is possible but very unlikely. In experiments A and B of Table IV, the chloriting was carried out with a great excess of sodium chlorite (over four times the amount recommended by Jayme). The lignin content of the holocellulose after ethanol extraction was still within the range given by Jayme, and yet the alcohol-soluble materials formed during the chlorite treatments were 5 to 6% of the weight of holocellulose. In the case of C and D, where *no* excess of chlorite was used but where the chloriting temperatures were higher than those given by Jayme, the holocellulose residues still retained significant amounts of extractives *despite the fact that they had been washed with hot ethanol prior to the Soxhlet extraction.*

* See, however, discussion in the section on "Possible errors in the hemicellulose determination."

In order to check the statements of Atchison *(10)* and Thomas *(8)* that nitrogenous materials were retained by holocellulose, when the latter was prepared by chlorination and alcoholic ethanolamine treatments, the following experiments were made. Samples of the extracted aspenwood (used by Thomas) and of black spruce (other than the one referred to above) were converted into holocellulose by the chlorite procedure. Nitrogen was determined in the original wood samples. In either case, the holocellulose samples were washed with ice water and acetone and air dried. A portion of each was then analyzed for nitrogen (micro-Kjeldahl). Another portion of each holocellulose sample was given the following treatment. The airdried material was heated at 75 to 78° C. for 2 minutes with 50 ml. of 3% alcoholic ethanolamine. These samples were then retreated in the same way, and washed successively four times with 95% ethanol, twice with distilled water, and repeatedly with ethanol until the residue was neutral to both litmus and alkacid paper. The final washing was made with ether, after which the residue was dried in air and finally at 100 to 105° C. Nitrogen determinations are given in Table V.

TABLE V.—EFFECT OF ALCOHOLIC ETHANOLAMINE ON THE NITROGEN CONTENT OF HOLOCELLULOSE

Nitrogen in	Aspen, %	Spruce, %
Original (extracted wood)	0.15	0.078
"Chlorite holocellulose" untreated	0.055	0.038
"Chlorite holocellulose" treated with alcoholic ethanolamine	0.224	0.377

These data (which are the results of closely agreeing duplicate determinations) indicate that, whereas the chlorite holocellulose isolation causes *loss* of nitrogenous material from wood, the subsequent alcoholic ethanolamine treatment of the holocelluloses causes a marked increase in nitrogen, *which in all cases exceeds that of the original wood sample.* Thus, the findings of Atchison and Thomas are fully substantiated.

The following experiment also serves as an indirect confirmation. When 0.9326 gram of Thomas' aspen holocellulose (calculated on the oven-dry basis and containing 0.57% nitrogen) was treated for 3 hours at 30 to 32° C. with 50 ml. of water containing 1 ml. of acetic acid and 1 gram of sodium chlorite, marked bleaching occurred. [The conditions were purposely very mild, because of Jayme's injunction *(11)* that complete delignification might cause some loss of carbohydrate.] The residue was washed with 110 ml. of ice water and dried; the dry weight was 0.9066 gram or 0.9034 gram on the ash-free basis. Assuming that all excepting 0.055% of nitrogen had been removed by the acid chlorite treatment (cf. Table V), the residual 0.515% nitrogen would correspond to an ethanolamine retention of 2.25%. Furthermore, Thomas' original holocellulose retained 0.2% ash and 0.4% lignin. Assuming that these are the impurities in his product, then 0.0285 × 0.9326 or 0.0266 gram would be the calculated amount of impurity in the original sample. The "corrected" weight of sample would then be 0.9060 gram, which agrees within 0.3% with the weight found—0.9034 gram.

The statement made by Jayme *(11)* that complete delignification by the chlorite method leads to marked losses of carbohydrate has been substantiated. Even when the delignification is not quite complete, holocellulose losses may occur. This was shown in the case of a sample of Douglas fir holocellulose which, after chloriting (and extraction with various organic solvents), retained only 0.4% lignin. The yield of holocellulose (corrected for lignin and extractives) was 69.4% (based on extractive-free wood). The percentage lignin in this sample was 28.5%, thus accounting for only 97.9% of the total extractive-free wood. In general, it has been found advisable to delignify the wood until only 2 to 4% of lignin remains in the isolated holocellulose. A simplified chlorite treatment permitting this is described in the next section.

Isolation of Chlorite Holocellulose

The earlier techniques *(12)* were altered as follows: Five-gram samples of wood meal (preferably 40 to 60 mesh) were used. If a resinous wood (like ponderosa pine) was to be analyzed, the sample was weighed directly into a "coarse" fritted glass extraction thimble, and extracted for 6 hours with ethanol, for 2 hours with ether, and then air dried. If a nonresinous wood (like aspen) was to be analyzed, the sample was weighed directly into a 250-ml. Erlenmeyer flask and chlorited. In either case, the air-dried wood sample was heated under a hood for 1 hour at 70 to 80° C. with 160 ml. of water containing 1.5 grams of sodium chlorite and 10 drops of glacial acetic acid. During this period, the reaction flask was sealed loosely by inverting into its neck a 25-ml. Erlenmeyer. At intervals the reaction flask was rotated gently. Chlorine dioxide was evolved slowly and reacted gradually with the lignin and extractives, the course of the reaction being followed readily by the color changes in the wood. At the end of the first hour, without cooling, 10 drops of glacial acetic acid were added directly to the mixture, followed by the addition of 1.5 grams of sodium chlorite. The suspension was then thoroughly mixed and the heating was continued for another hour at 70 to 80°. With coniferous woods this entire treatment was repeated twice more. With certain hardwoods, and more especially with fibrous raw materials from annual plants, the fourth treatment could be omitted. With unbleached pulps, only one 20 to 35-minute treatment was required. The length of the chloriting period is largely a matter of experience and no set formula can be laid down. In general, when a new raw material is to be tested, orienting experiments are in order. In the case of extracted softwoods, four periods (i.e., a total of 4 hours), using 6 grams of sodium chlorite, suffice to bring the lignin content of the holocellulose down to 2 to 4%. At the end of the final period, the residue should be white and should retain the original woody structure. The suspensions are cooled in an ice bath, filtered by suction through a coarse fritted glass thimble (Pyrex or Jena 3 SyG 1), and then washed repeatedly with ice water and finally with acetone. The residue is then air dried.

Certain precautions should be emphasized. The state of division of the wood sample is important. Very fine wood or holocellulose particles serve to impede filtration, hence samples finer than 60-mesh must be avoided. Air-dried, not oven-dried wood should be used in chloriting, and any hollocellulose that is to be fractionated further must also be air dried, not oven dried. Inasmuch as chlorine dioxide is toxic, all chloriting and filtration procedures must be carried out in a hood. In adding reagents to the suspension, it is essential that the solution be faintly acid at all times. Hence, the addition of acetic acid must precede that of sodium chlorite.

Using the technique described above, large (100 to 200 grams) samples of chlorite holocellulose were also prepared within a single working day. In such cases, proportionate amounts of water, acetic acid, and so-

dium chlorite were used. Otherwise, the delignification was identical with that described for small analytical samples. These larger samples form excellent raw materials for the intensive study of hemicellulose fractions and pectic materials, and for chain length determinations as well.* They also serve as starting products for individual analytical determinations (e. g., mannan).

Extraction of Hemicelluloses from Holocellulose

Preliminary Experiments

In the removal of hemicelluloses from holocellulose or from wood, sodium hydroxide solutions are generally used *(14)*. Thomas *(8)*, however, introduced the use of potassium hydroxide largely because of the higher alcohol solubility of potassium acetate, which is formed later in the precipitation of hemicellulose fractions. In the present study, potassium hydroxide was also used. In order to determine the effect of various strengths of alkali on hemicellulose removal, experiments were made with aspen and spruce holocelluloses. These woods typify hard and softwoods used in pulping, and in both cases large batches of holocellulose were prepared by the sodium chlorite procedure outlined above. The air-dried holocelluloses were then subjected to systematic treatment with gradually increasing concentrations of aqueous potassium hydroxide under nitrogen at 20° C. In every case the extractions were made for 2-hour periods with 100 ml. of the alkaline solution, after which the residues were filtered immediately by suction through Jena 3 SyG 1 thimbles and washed successively with 100 ml. of potassium hydroxide (of the same strength as that used in the extraction), 250 ml. of water, 25 ml. of 10% acetic acid, 100 ml. of water, and 50 ml. of acetone. The fibrous residues were then dried to constant weight and the percentage yield was computed on the basis of the extractive-free dried wood and also on the basis of the holocellulose corrected for extractives, lignin, and ash. Furthermore, the pentosan retention in these residues was determined. The data for aspen are given in Table VI. This holocellulose contained 0.8% alcohol-soluble extractives, 3.6% lignin, and 0.9% ash. Spruce gave entirely analogous results, which have not been tabulated.

TABLE VI.—PERCENTAGE RESIDUES AND THEIR PENTOSAN CONTENT, OBTAINED FROM ASPEN HOLOCELLULOSE AFTER EXTRACTION WITH POTASSIUM HYDROXIDE

Extraction with	Residue, %		Pentosan, %	
	Based on Extractive-Free Wood	Based on Holocellulose *	Based on Extractive-Free Wood	Based on Residue After Extraction
0% KOH (untreated)	(81.7)*	(100)	18.9	23.1
2%	60.0	73.4	9.6	15.9
4%	55.9	68.4	5.4	9.6
6%	53.1	64.9	3.1	5.9
8%	52.0	63.7	2.0	3.8
10%	51.1	62.6	1.4	2.8
12%	51.4	62.9	1.6	3.1
14%	51.4	62.9	1.7	3.2
16%	51.0	62.4	1.4	2.7
20%	50.4	61.7	1.1	2.2
24%	49.9	61.1	1.1	2.1
30%	49.5	60.6	1.1	2.2

* Holocellulose corrected for ash, extractives, and Klason lignin.

It is evident that the percentage residue drops rapidly with increasing concentration of potassium hydroxide until a concentration of 10% alkali is reached. At this point there is an insignificant increase in residual matter up to a concentration of about 16% potassium hydroxide, after which there is a further very gradual drop in the amount of residue after extraction. There is no sharp maximum solubility of holocellulose in potassium hydroxide, such as that reported for sodium hydroxide extractions of pulps *(13a, 15)*. The study makes it appear that choice of alkaline concentrations used in removing hemicelluloses from holocellulose is an arbitrary one. The data for pentosans given in Table VI show that the removal of this component is well correlated with that of the hemicelluloses. Inasmuch as the minimum pentosan value is that obtained from the residue remaining after extraction with 24% potassium hydroxide, and because there is relatively little further removal of hemicellulosic material by using 30% potassium hydroxide, it seemed logical to carry out the final extraction of holocellulose with 24% potassium hydroxide. Empirical experience also taught that it was best to remove the hemicelluloses in two rather than in one fraction, and because 5% potassium hydroxide removed a large portion of the hemicelluloses (and pectic material) high in uronic acid groups, this concentration was chosen for a preliminary extraction, which was then followed by a second extraction with 24% potassium hydroxide. The final alkali-insoluble residue has been termed, for the sake of convenience, "alpha-cellulose," although semantically a better term might be "fibrous material insoluble in 24% potassium hydroxide." No alpha-cellulose fraction from wood is entirely free from apparent furfural-yielding material, which may be due to xylose residues, to uronic acid residues, or even to hydroxymethylfurfural from cellulose itself.

The detailed alkaline extraction procedure used in the quantitative determination of hemicelluloses was the following: The holocellulose sample is transferred quantitatively from the original thimble to a wide-mouth 500-ml. Erlenmeyer flask fitted with a dropping funnel and two right-angle bends, one of which reaches to the bottom of the flask and both of which carry glass stopcocks. Nitrogen gas is then passed through the flask for 10 to 15 minutes so that nearly all air is displaced. Subsequently 100 ml. of 5% potassium hydroxide at 20 ± 1° C. are introduced through the dropping funnel while the flask is gently shaken, and the uninterrupted passage of nitrogen is continued for another 10 minutes. The mixture (which should be amber colored but never brown) is then placed into a thermostat kept at 20 ± 1° C. for 110 minutes, with shaking at 10-minute intervals, and is then filtered with suction through the original thimble. An excess of glacial acetic acid should be placed in the suction flask into which the solution is filtered. The fibrous residue is then washed successively with 50 ml. of 5% potassium hydroxide and with 150 ml. of water, all washings being filtered into the suction flask. The filtrate is then tested for acidity and is transferred to a 2-liter Erlenmeyer flask, and the suction flask is rinsed out several times with small amounts of 95% ethanol to insure complete transference. Enough ethanol is then added to fill the Erlenmeyer flask, the contents of which are thor-

* W. H. Shockley of the Institute staff kindly determined the degree of polymerization (D.P.) of two samples of aspen holocellulose, prepared from the same extractive-free wood. One was prepared by the chlorine-ethanolamine procedure by Thomas *(8)* and the other was isolated by the chlorite method. The latter still contained considerable lignin, as shown by a strong Maüle reaction and by the fact that the nitrated holocellulose contained an appreciable amount of acetone-insoluble matter for which due allowance was made. The following data are of interest because they show that the over-all degree of polymerization is practically identical for either holocellulose.

Aspen Holocellulose Isolated by Means of	Nitrated Holocellulose g./l.	η_{sp}	D.P.	Av. D.P.
Chlorine and ethanolamine	0.0774	0.1400	1646	
	0.0623	0.1077	1570	1608
Sodium chlorite and acetic acid	0.0603	0.1067	1608	
	0.0542	0.0960	1612	1610

oughly mixed. The resulting white flocculent precipitate is designated "Hemicellulose A."

The fibrous residue is again quantitatively transferred from the thimble to the Erlenmeyer flask used for extraction, and the entire operation is repeated, using 24% in place of 5% potassium hydroxide. The final fibrous residue filtered through the original thimble, however, undergoes a different washing treatment. It is first washed with 25 ml. of 24% potassium hydroxide, followed by 150 ml. of water and 25 ml. of 10% acetic acid. Here too, the filtrate immediately strikes an excess of acetic acid in the filtering flask, and the filtrate and washings, when mixed, should be distinctly acid. The hemicellulose precipitation is then carried out in another 2-liter Erlenmeyer flask, with alcohol, as outlined above. The white precipitate is termed "Hemicellulose B." The remaining fibrous residue "alpha-cellulose" is then washed further with water until neutral to alk-acid paper and with 50 ml. of acetone, and dried to constant weight. It should be pure white.

The flocculent precipitates Hemicelluloses A and B are allowed to settle and the respective mother liquors are removed as completely as possible by means of a siphon. The remaining precipitates and solutions are transferred quantitatively to centrifuge bottles and washed in the centrifuge with 95% alcohol to remove water and finally with ether to remove the alcohol. The hemicelluloses in ether suspension are then transferred to and filtered on weighed Pyrex (M) fritted glass crucibles, washed with ether, and dried in air and finally to constant weight at 100° C.

Ash in Hemicellulose Fractions and Possible Errors in the Hemicellulose Determination

In our experience, the alpha-cellulose fractions are usually ash free. However, all hemicellulose fractions contain appreciable amounts of ash (often 10-20%), largely in the form of potassium salts. The most satisfactory method of ashing was to carbonize the hemicellulose gently, cool, treat with a drop or two of sulphuric acid, and heat until all fuming ceased. The ash was then heated to low red heat, cooled, and weighed. It should be nearly white and almost completely water soluble. The problem of correcting for this ash presents difficulties. A part of the mineral components in the dry hemicelluloses may be present as potassium acetate and a portion must be present as the potassium salts of polyuronic acids. Small amounts of iron and silica may also be present. It has been found expedient, however, to assume that only potassium acetate was present, and to multiply the sulphated ash (which is largely potassium sulphate) by 1.13 to convert it to the corresponding acetate. Correction of the weights of the hemicelluloses is made on this basis. If other components are present, this arbitrary correction for "ash, as potassium acetate," will give an ash figure that is slightly high, and values for the hemicelluloses will be correspondingly lower. In the case of coniferous woods, such errors probably are not serious.

However in the case of hardwoods, such errors may be appreciable. This may be demonstrated by the following example. A sample of hardwood taken for analysis weighed 4.4865 grams (on the dry basis). The hemicellulose A fraction from this weighed 1.022 grams (uncorrected for ash). The total sulphated ash in this fraction, when calculated to potassium acetate, was 0.123 gram (i.e., 12% of the fraction). Corrected on this basis, the hemicellulose A was 0.899 gram (18.6%) of the original wood sample. In the case under discussion, the uronic anhydride present in hemicellulose A was shown to be 15.2% of the entire fraction. This corresponded to 3.37% of potassium, provided the assumption was made that each carboxyl group combined with one potassium atom.

The originally computed 0.123 gram of potassium acetate (i.e., the amount assumed to be present in hemicellulose A) would be equivalent to 0.0489 gram of the element potassium. If this is termed *(I)* and the weight of potassium combined with uronic acid carboxyls is termed *(II)*, then *II* equals $39/176 \times 0.152 \times 1.022$ or 0.0344 gram, and *I* minus *II* is the weight of potassium probably present as the acetate or 0.0145 gram. If this is converted to potassium acetate, the calculated value is 0.0364 gram *(III)*. Then the sum of *II* and *III* gives the probable foreign matter in hemicellulose A. This is 0.0708 gram (which is very different from the 0.123 gram originally computed). The total percentage of nonhemicellulosic matter then becomes 6.93% (instead of 12%), and the corrected value of hemicellulose A on the new basis is 0.9512 gram. This is 19.6% of the original dry wood (instead of 18.6% as originally computed). This accounts for a part of the low summative results obtained with aspen. On the other hand, it is seldom expedient to make uronic acid determinations on all hemicellulose fractions prior to ashing.

Another slight error in the summative analysis of wood may be encountered in the possible retention of small amounts of lignin in the hemicellulose fractions. Unless the latter are given brief treatments with bromine, as described by Anderson, *et al. (16)*, hemicellulose fractions prepared from chlorite holocellulose give slight positive tests for lignin by the Maüle color reaction. In our first experiments hemicellulose A fractions were invariably treated with bromine, prior to their precipitation with alcohol, but this treatment was later discontinued. The Maüle test is so sensitive that even traces of lignin respond to the color test. When alkali-soluble lignin is precipitated with acetic acid, it dissolves readily and completely in either alcohol or acetone, and not more than small amounts could be absorbed by the hemicelluloses precipitated under these conditions. Lignin retention would tend towards slightly higher hemicellulose weights, whereas the ash corrections tend towards slightly low results. Thus the errors (which in most instances are small) tend to balance each other.

What may be a more serious error, manifested only in sporadic instances, is a discrepancy between the uronic acid content as determined in the wood and that found in the holocellulose. The uronic acid content of the latter (calculated on the basis of the original wood) may be higher than that of the wood itself. A full explanation of this discrepancy cannot be given at present, because the data are still too meager. In the few cases in which the distribution of the uronic anhydride in the two hemicellulose fractions have been determined, the summations of the uronic anhydride (calculated on the basis of the wood) showed small *losses*, not gains. However, Nickerson and others *(16a)* have shown that, in the presence of ferric chloride, hydrochloric acid liberates carbon dioxide rapidly from glucose, and also (but more slowly) from cellulosic materials as they hydrolyse to glucose. Inasmuch as even the analytical grade of sodium chlorite is not completely free from

iron, it is possible that this accounts for a catalyzed carbon dioxide evolution in the case of holocellulose fractions, thus giving rise to fictitiously high values of apparent uronic anhydride. This suggestion is made with the greatest reservation, because there are no experimental data to either confirm or disprove this hypothesis.

The Summative Analysis of Wood

In the course of this investigation a number of woods were studied other than those referred to in the introduction. These included composite samples of loblolly pine, western red cedar, western hemlock, ponderosa pine, and several species of oaks. Furthermore, several varieties of sugar cane were also converted into holocellulose and subjected to analytical study.

Most of these analyses await future publication, but the data on ponderosa pine exemplify the analytical studies made with other species.

The sample of pine was obtained through the courtesy of the Longview Fiber Company, being taken from sections of several planks of the wood, and reduced to a coarse meal in the Wiley mill. The 40 to 60 mesh sample (5 grams) was extracted successively with alcohol and ether, and was then chlorited by the procedure given above. The holocellulose was fractionated (as already described) into hemicellulose A, hemicellulose B, and alpha-cellulose by the use of potassium hydroxide. Furthermore, analyses on the wood included percentage ash, alcohol-soluble material, water-soluble extractives (after alcoholic extraction), lignin, acetyl, xylan (corrected for uronic anhydride), uronic anhydride, mannan, methoxyl in the extracted wood, and methoxyl in the lignin. The isolated alpha-cellulose was also analyzed for xylan, uronic anhydride, and mannan. These determinations (made by various Institute methods) permit two very different sets of summative analytical data. One such set is given in Table VII. This is quite typical, although the summation is fortuitously close to 100%. The assumption is made that the sum of extractives, lignin, ash, acetyl (which is naturally lost in the alkaline extraction of the hemicelluloses), hemicelluloses A and B, and alpha-cellulose accounts for the entire wood sample. The results are the averages of duplicate or triplicate determinations.

TABLE VII.—SUMMATIVE ANALYSIS OF PONDEROSA PINE

	%
Alcohol extractives	7.04
Hot water extractives (from residue after alcoholic extraction)	2.12
Ash	0.19
Lignin	24.40
Acetyl	0.68
Hemicellulose A	10.60
Hemicellulose B	2.95
Alpha-cellulose	51.90
	99.88

The data given in Table VIII rest on the following assumptions. Provided that the alpha-cellulose fraction is itself analyzed for pentosans (computed as xylan), uronic anhydride, and mannan, and provided due correction is made for these components, the corrected alpha-cellulose value should represent only the *alkali-resistant anhydroglucose chains* in the wood. Then if, on the original extractive-free wood sample, analyses are made for mannan, xylan, uronic anhydride, and acetyl, these should account for practically the entire hemicellulosic material in the wood substance (other than alkali-soluble glucosans). The only other hemicellulose component *not* accounted for is the methoxyl radical associated with the uronic acid residues in the wood (i.e., those *not* present in the lignin). These can be found by determining both the methoxyl in the extractive-free wood, and the methoxyl in the lignin, and calculating the latter on the original wood basis. The difference between this figure and that for the methoxyl in the wood itself is presumably due to the percentage methoxyl in the hemicelluloses. However, to prevent overlapping, this percentage methoxyl is not used directly in the summation. Instead the percentage "CH_2" calculated therefrom is used. These analyses and computations thus give the basis for another type of summative wood analysis. The one important item that is missing is "soluble glucosan," which might be determined by quantitatively hydrolyzing the combined hemicellulose fractions and subjecting the neutralized hydrolyzate to hexose fermentation. (This would give combined glucosan and mannan contents.) The mannan may then be determined separately as the phenylhydrazone. Inasmuch as fermentations for small percentages of hexose sugars lack precision *(8)* and because the accuracy of the mannan determination is none too satisfactory, this glucose analysis has been dispensed with. The analysis of the alpha-cellulose (obtained in 51.88% yield) was as follows: Percentage ash, 0; mannan, 9.5; xylan, 2.85; uronic anhydride, 2.2. Table VIII gives the second summative analysis of ponderosa pine *in which neither the percentages for Hemicellulose A nor Hemicellulose B are used.*

TABLE VIII.—SUMMATIVE ANALYSIS OF PONDEROSA PINE

	%
Total extractives	9.16
Ash	0.19
Acetyl	0.68
Xylan (corrected for uronic anhydride)	8.60
Uronic anhydride	3.00
Alpha-cellulose (corrected for various components)	44.33
Mannan	7.20
Lignin	24.40
CH_2 (from methoxyl not in lignin)	0.23
	97.79

Inasmuch as no provision is made for soluble glucosans the results in Table VIII may be considered a satisfactory summation, and furnish confirmation of those given in Table VII.

Analysis of Pulps

The application of the chloriting technique to various pulps and the alkaline fractionation of pulp "holocellulose" has not been fully studied. The method however, has been applied to two unbleached, relatively hard sulphate pulps. I and II may serve as examples. In either case approximately 50-gram samples of the air-dried pulps were shredded and chlorited once only at 60 to 70° C. for 35 minutes, using a solution of 15 grams of sodium chlorite, and 5 ml. of acetic acid in 1600 ml. of water, *and stirring vigorously throughout the entire heating period.* At the end of this time, the pulp suspensions were cooled in an ice bath, filtered by suction, washed with ice water and acetone, dried, and weighed. The yield from pulp I was 93.9%; that from pulp II was 93.1%. Smaller (5 grams) samples were treated similarly with 160 ml. of water, 10 drops of acetic acid, and 1.5 grams of sodium chlorite. In this case the chloriting period *(76 to 80° C.)* was held to about 10 minutes. The airdried "holocellulose" was separated into Hemicellulose A and B fractions, and into alpha-cellulose by the usual procedure (using, however, 170 ml. of alkali in the extractions). Results are given in Table IX.

When they are compared with actual holocellulose yields, these data indicate that the pulp "holocelluloses" have been accounted for quantitatively by the

TABLE IX.—FRACTIONATION OF SULPHATE PULPS

(Basis of moisture-free original pulp)

Pulp	Holocellulose Yield, %	Hemicellulose A, %	Hemicellulose B, %	Alpha-cellulose, %	Ash, %	Total accounted for in summation
I	93.9	2.75	3.2	87.55	0	93.5
II	93.1	3.35	3.7	86.6	0	93.65

summation of the three components. The over-all summative analyses of these pulps are given in Tables X and XI.

TABLE X.—COMPLETE ANALYSES OF SULPHATE PULPS

	Pulp I, %	Pulp II, %
Ash	0.66	0.96
Alcohol extract	0.55	0.62
Lignin	5.78	5.26
Alpha-cellulose	87.55	86.60
Hemicellulose A	2.75	3.35
Hemicellulose B	3.20	3.70
Total	100.49	100.49

When the alpha-cellulose fractions were separately analyzed for mannans, xylans, and uronic anhydride, and due correction was made for these components, and when these components were also determined in the pulp sample itself, the following data were obtained (Table XI). This gives a summation on a different basis.

TABLE XI.—COMPLETE ANALYSES OF SULPHATE PULPS

	Pulp I, %	Pulp II, %
Ash	0.66	0.96
Alcohol extract	0.55	0.62
Alpha-cellulose (cor.)	79.80	79.94
Mannan	5.08	3.75
Xylan	4.94	5.63
Uronic anhydride	2.26	2.08
Lignin	5.78	5.26
Total	99.07	98.24

The agreement between Tables X and XI is satisfactory.

Since the chloriting procedure also permits the rapid (and quantitative) delignification of large pulp samples within a very short time period, such holocellulose preparations may then be subjected to further and more intensive study, the full significance of which has not yet been explored.

Discussion

Holocellulose isolated by the chlorite method, and its various fractions, may be used effectively in the summative analysis of coneferous woods. In the case of hardwoods, the method does not appear to be as satisfactory. In any event, the seeming uncanny precision of *any* proximate wood analysis is, in part, happenstance. This is true, irrespective of whether holocellulose has been isolated by means of chlorine or by the use of sodium chlorite. There appears to be a neat balancing of slight errors, the more obvious of which have been discussed. In our opinion, the summative analysis accounts for 98 to 100% of a coniferous wood. In a case of hardwoods, the summations ordinarily fall below 98% of the wood.

However, the chief value of the chlorite method for holocellulose appears to be not in proximate analysis but as a research tool. Large laboratory samples of holocellulose may be prepared in the course of a day, and the hemicellulose fractions from such preparations may be studied qualitatively and quantitatively. There is also ample experimental evidence *(13)* that this holocellulose forms an excellent raw material for the isolation and study of the small amounts of pectic material inherent in wood.

Although, experimental data are still meager, it would appear that the chlorite procedure when applied to pulp may cause *complete* delignification and that the carbohydrate components can be fractionated without loss. Whether or not further investigations will ever permit a correlation between hemicellulose type and pulp quality is an interesting question, and one which is now being studied.

Whether or not there is justification for the claim of Staudinger and Jurisch *(17)* that chlorine dioxide has a very slow depolymerizing action on cellulose is still a moot question. Jayme *(11)* was able to prepare a modified holocellulose (by the use of sodium chlorite and acetic acid followed by a mild alkaline extraction) which showed degrees of polymerization varying from 1300 to 1700. On the other hand, Atchison *(10)* reports marked degradation even when cotton linters were treated with the chloriting mixture. His data indicate that chlorine water is less destructive than is chlorine dioxide. In any event, it now becomes possible to obtain a lignin-free product from pulp, which can be used in the effective study of chain length and chain-length distribution, which may lead to interesting conclusions regarding pulp properties and uses.

Acknowledgment

Thanks are due to Dr. P. F. Cundy and Mr. L. O. Bublitz of The Institute of Paper Chemistry for carrying out certain of the analyses given in Tables I, VII, and VIII.

Literature Cited

1. Schmidt, E., Meinel, J., Jandebeur, W., and Simson, W., *Cellulosechem.* 13, No. 8/9: 129-139 (Aug./Sept., 1932).
2. Schmidt, E., Tang, Y. C., and Jandebeur, W., *Cellulosechem.* 12, No. 7: 201-212 (July, 1931).
3. Ritter, G. J., and Kurth, E. F., *Ind. Eng. Chem.* 25, No. 11: 1250-1253 (Nov., 1933).
4. Kurth, E. F., and Ritter, G. J., *J. Am. Chem. Soc.* 56, No. 12: 2720-2723 (Dec., 1934).
5. Van Beckum, W. G., and Ritter, G. J., *Paper Trade J.* 104, No. 19: 49-50 (May 13, 1937); 105, No. 18: 127-130 (Oct. 28, 1937); 108, No. 7: 27-29 (Feb 16, 1939); 109, No. 22: 107-109 (Nov. 30, 1939); *Tech. Assoc. Papers* 21: 431-434 (1938); 22: 619-622 (1939); 23: 652-654 (1940).
6. Freeman, R. D., and Peterson, F. C., *Ind. Eng. Chem., Anal. Ed.* 13, No. 11: 803-805 (Nov., 1941).
7. Thomas, B. B. The preparation of aspen holocellulose and a chemical study of its fractions. Ph.D. Dissertation. Appleton, Wis., The Institute of Paper Chemistry, 1944. p. 33, Experiments III and IV.
8. Thomas, B. B., *Paper Ind.* 26, No. 10: 1281-1284 (Jan., 1945).
9. Anderson, A. B., *Ind. Eng. Chem.* 36, No. 7: 662-663 (July, 1944).
10. Atchison, J. E. The influence of cooking and bleaching upon the chain length distribution of the carbohydrate fraction in pulpwood. Ph.D. Dissertation. Appleton, Wis., The Institute of Paper Chemistry, 1942. p. 44-49. Cf. also *Paper Trade J.* 116, No. 22: 23-24 (June 13, 1943); *Tech. Assoc. Papers* 26: 233-244 (1943).
11. Jayme, G., *Cellulosechem.* 20, No. 2: 43-49 (March-April, 1942).
12. Wise, L. E., *Ind. Eng. Chem., Anal. Ed.* 17, No. 1: 63-64 (Jan., 1945).
13. Anderson, E. Private communication.

13a. Lovell, E. L., *Ind. Eng. Chem.* 37, No. 11:1034-1037 (1945).

14. Norman, A. G. *In* Wise, Wood chemistry. New York, Reinhold Publishing Corp., 1944. p. 252-271.
15. Ross, J. H., and Shotwell, J. S. G., *Pulp Paper Mag. Canada* 27, No. 11: 379-382, 397; No. 12: 431-434, 454 (March 14, 21, 1929).
16. Anderson, E., *et al., J. Biol. Chem.* 135: 189-198 (1940).

16a. Nickerson, R. F., *Ind. Eng. Chem.* 33:1022 (1941); 34:85 (1942). Conrad, C. C., and Scroggie, A. C., *Ibid.* 37:592 (1945). Nickerson, R. F., and Habrle, J. A., *Ibid.*, 37:1115 (1945).

17. Staudinger, H., and Jurisch, J., *Papier-Fabr.* 35, No. 49: 462-469 (1937).

Organic Preparations

The Interscience Publishers, Inc., has just issued a translation and revision of Organic Preparations by Conrad Weygand, Professor at the University of Leipzig. Permission for the translation was given by the Alien Property Custodian (534 pp. 6 x 9). The book presupposes a knowledge of elementary organic chemistry and explains in detail such subjects as the formation of carbon-hydrogen bonds, cleavage of bonds, formation and fission of carbon-carbon bonds and rearrangement of carbon compounds with the exception of steric rearrangements.

Copies may be obtained from the Book Department of the Technical Association of the Pulp and Paper Industry, 122 East 42nd Street, New York 17, N. Y.. at $6.00 per copy.

TAPPI Notes

The TAPPI New England Section will meet in the Georgian Room, Hotel Statler, Boston, Mass. on Friday, January 18, 1946. There will be a get-together at 4 p.m., followed by a motion picture at 5 p.m. on Careers for Cellulose. The dinner speaker will be Prof. W. D. Schwartz of the Massachusetts Institute of Technology, who will talk on the Form Factor.

Fred W. Green has succeeded C. L. Clark as the representative of the Nash Engineering Company in the Technical Association.

Capt. H. G. Lankenau recently of the Army, is now with the General Process Equipment Company, 420 Lexington Ave., New York, N. Y.

Paul J. Carlisle, of E. I. du Pont de Nemours Company, has been transferred from Niagara Falls, N. Y., to Wilmington, Del.

E. M. Lorenzini, of the American Bitumuls Company, has been transferred from E. Providence, R. I., to 641 Judson Ave., Evanston, Ill.

Roy D. Rivers, formerly of Industrias de Papel Simao, Sao Paulo, Brazil is now with the Agencia Elof Hansson, Einar Mortenson, Caixa Postal 1010, Sao Paulo, Brazil.

Max Oberdorfer, Jr., has returned from the Army Transportation Corps to the St. Helens Pulp & Paper Company as engineer.

The Technical Section of the Canadian Pulp and Paper Association will meet at the Mount Royal Hotel, Montreal, P. Q., on January 23-25 inclusive.

The TAPPI Ohio Section will meet at the Manchester Hotel, Middletown, Ohio, on January 10, 1946. There will be a discussion on Stream Improvement.

The TAPPI Lake States Section will meet at the American Legion Club House, Appleton, Wis., on Tuesday, January 8th at 6:30 p.m. J. A. Fritz of the Allis-Chalmers Company, Milwaukee, will discuss the hydraulic barking of logs. A motion picture will be shown of the wood peeler developed by the Nekoosa Foundry and Machine Works.

Major R. T. Greep, formerly of the C.W.S. Development Laboratory at Massachusetts Institute of Technology, has returned to the S. D. Warren Company, Cumberland Mills, Maine.

Major Clarence W. Scott, now on terminal leave from the Chemical Warfare Service will return to the Springhill, La., mill of the International Paper Company about February 15th as technical assistant to the plant manager. Major Scott spent about a year in the European theatre on a special technical intelligence assignment and two and one-half years in manufacturing operations of the C.W.S. at Huntsville, Ala., arsenal.

John F. Rhoads, formerly of Johnson & Wierk, Inc., is now project engineer for Hardy S. Ferguson, Inc., 200 Fifth Ave., New York, N. Y.

Y. S. Chaudhary, formerly of the Bombay Paper and Board Mills is now general manager of the Upper India Couper Paper Mills Company, Lucknow, India.

John Tweedie, formerly of Reed & Smith, Ltd., is now manager of the Waasbrough Paper Mills, Watchet, Somerset, England.

George E. Fromm is now product manager of paper sizes for the American Cyanamid & Chemical Corporation, 30 Rockefeller Plaza, New York 20, N. Y.

Donald E. Bradner, formerly director of research for the Champion Paper and Fibre Company, Hamilton, Ohio, has been presented with the War Department Certificate of Appreciation for outstanding service as a technical advisor to the Chief of the Chemical Warfare Service during the war.

Delaware Valley TAPPI Talks Housing

The Delaware Valley Section of the Technical Association of the Pulp and Paper Industry met at the Engineers Club, Philadelphia, Pa. on Friday, January 4th. A. L. M. Bixler of the Riegel Paper Corporation presided as chairman.

Kingdon Watt of the Curtis Paper Company, chairman of the program committee introduced the principal speaker, Griffith Clark, Vice President of Precision Built Homes, Trenton, N. J., who talked on "The Use and Abuse of Fiber Board in Modern Home Construction." Mr. Clark pointed out that the fiberboard construction of temporary federal government buildings constructed in Washington, D. C. in 1917 are still being used. There is much work to be done by the industry to produce an acceptable board. There is no suitable flooring panel on the market. An effort should be made to provide a satisfactory 8 lb. 12 or 14 ft. board. This would reduce the number of joints, compared with presently available boards by 22% and would require 15% less nailing.

Moisture absorption of board constitutes a major problem. Within the last year the foil manufacturers have been putting pressure on the housing agencies to use foil to keep out moisture from building boards. Some codes require 5/8 inch coat of plaster. The Bureau of Standards specification requires that this be put on three coats, each dried for 24 hours. Putting on one thick coat, a violation of the specification, is common and causes much trouble.

A spectacular motion picture was shown entitled, "How to Build a House in 78 Minutes." This was a demonstration of the mass housing project at Alexander Corners, Va. In five months 5000 houses were constructed on 990 acres to meet the housing problem at the Norfolk Navy Yard. For this 533 carloads of Homosote wall board was used. It was all expanded by wetting prior to installation.

Those present included: C. S. Albert, Edw. J. Albert, C. N. Apgar, Bernard K. Asdell, E. R. Baublitz, H. L. Becher, A. L. M. Bixler, Geo. K. Boger, Jr., George Borden, Jr., F. W. Brainerd, H. C. Brill, S. G. Briscoe, K. W. Britt, Arnold M. Brown, Philip G. Bruno, J. W. Burke, L. B. Carothers, Chas. Carr, Cornelius F. Carr, Griffith Clark, J. D. Clark, Fred S. Crysler, Wm. B. Darling, Helen Marie Dearden, J. C. Dieffenderfer, W. P. Dohne, J. Edward Doyle, J. R. Dufford, James C. Eaton, James M. Farnum, Jeanne H. Fisher, Mary Ruth France, G. D. Fronmuller, H. L. Geer, Philip H. Goldsmith, Ralph E. Green, Lois W. Hans, J. C. Harper, Jr., Howard K. Hays, Harry Hulmes, Valdemar Jacobsen, Sewell T. Jamison, W. N. Jones, L. T. Kratz, Geo. D. Lord, J. Macadam, John W. MacAllister, R. G. Macdonald, William March, George B. Martin, C. S. Maxwell, Robert McAloan, D. Kenneth McCurdy, Louise E. McGrath, H. C. Merritt, Lewis B. Miller, Edward C. Molin, George V. N. Morin, L. M. Nauman, J. A. Paciello, Homer F. Ray, Henry Reeves, Jr., E. M. Regier, G. T. Renegar, C. H. Rice, F. W. Ropp, Harold J. Schaibley, Allan Schenck, George C. Shertenlieb, Chas. A. Shubert, Mildred Simon, E. R. Smith, Howard H. Street, Ray Tomlinson, T. W. Toovey, D. R. Traill, Roy H. Underdown, Jack Ward, Kingdon R. Watt, John Weber, John P. Weidner, Ray Wilcox, William R. Willets.

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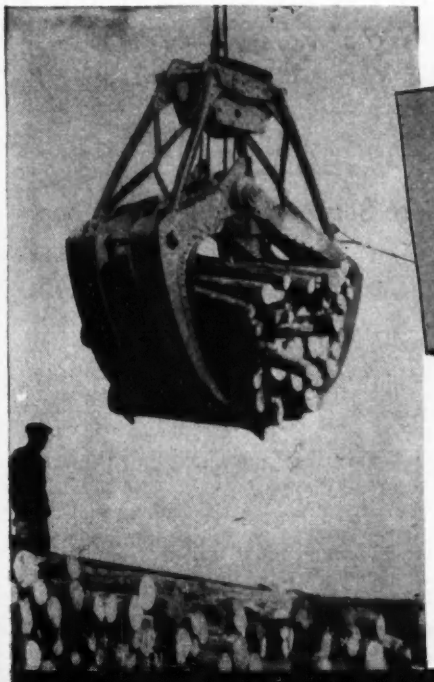

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New York Paper and Pulp Market Review

OPA Increases Prices From $3 To $14 A Ton On 19 Groundwood Specialty Papers — Paper and Pulp Prospects Good — Allocation Control Order M-241 Partly Amended—Folded News Still Scarce.

Office of the PAPER TRADE JOURNAL,
Wednesday, January 9, 1946.

Prospects in the paper industry continue favorable. Consumer demand for paper and allied products is, of course, closely tied to general business activity. The transition from war to peace has yet to be completed. The general increase in wages demanded has yet to be settled and work stoppages and price ceiling have yet to be equitably adjusted to meet post-war conditions. Unemployment is increasing and is expected in some quarters to rise until the end of the year. This general situation affects all segments of the national economy. Some months will doubtless pass before the general unsettled situation becomes clear, the conservative forecast appears to appraise the task of transition as a bigger job and requiring more time than is commonly believed. At the present time the wage and price situations are the chief deterrents to the transition effort.

Price increases from $3 to $14 a ton have been granted by the OPA in manufacturers' ceiling prices for 19 low-end grades of groundwood specialty papers; poster $3; railroad Manila and B-1 converting, $5; canary pencil tablet, $6; B-printing and B-printing supercalendered, $8; B-publication, supercalendered rotogravure, B-mineograph, B-drawing, carbonizing, lining, coating, white pencil tablet, and B-2 converting, $10; No. 2 hanging, lightweight directory, and lightweight catalogue, $11, and novel, $14 a ton. This is Amendment 5 to the maximum price regulation, and became effective December 29, 1945.

The index of general business activity for the week ended December 29, declined to 114.3 from 126.1, due to the holiday, compared with 138.4 in the corresponding week in 1944. The index of paperboard production was 103.9, compared with 149.1 in the preceding week, and with 116.0 in the corresponding week in 1944.

Paper production for the week ended December 29 was estimated at 58.2%, compared with 62.0% for 1944, with 70.0% for 1943, with 63.3% for 1942, and with 79.3% for the corresponding week in 1941.

Paperboard production for the week ended December 29 was 57.0%, compared with 63.0% for 1944, with 87.0% for 1943, with 72.0% for 1942, and with 76.0% for the corresponding week in 1941.

The Civilian Production Administration removed on January 1, 1946, allocation controls on paper and paperboard through amendment of Order M-241. The part of the order covering reserve production percentages of paper mill production for filling government needs, has been revoked, while the portion restricting consumer, merchant and mill inventories, was transferred to Priorities Regulation 32. This provides for a practicable working inventory minimum.

Wood Pulp

Production of pulpwood in November was seasonally lower, due to fewer work days influenced by the weather, with mill receipts totaling 1,247,551 cords, compared with 1,535,158 cords in October.

Wood pulp production in November totaled 846,209 tons, or about 39,000 tons under October. Reports of inventories at the paper mills indicate a continued improvement over the low level of last August.

Rags

Limited supplies to meet the heavy current demand for cotton cuttings continues in reports this week. The unsatisfactory price situation in the textile industry has checked the production of medium and cheaper grades of clothing and the situation is still confused. Prices are firm at ceilings.

Roofing mills continue active in purchasing any grades of old cotton rags available. Prices are firm.

Old Rope and Bagging

No important change in the old rope and cordage market has been reported this week. Demand for Manila is above supply and no large importations of new fiber have been recently reported. Prices are unchanged.

More inquiries are reported at this date in scrap bagging but no material change in this market has been reported. Prices are unchanged. The international allocation of jute goods ended the first of the year. The OPA will temporarily require authorization to import jute goods under General Imports Order M-63, pending amendment of Order M-47 Burlap.

Old Waste Paper

Demand for waste paper has again become heavy after the holidays. All grades are wanted, with the heaviest demand in folded news and No. 1 mixed grades. Prices are firm at ceiling levels in all grades.

Strathmore Settlement Puzzles Labor

HOLYOKE, Mass., January 4, 1946—Union leaders in the paper mill trades in Holyoke were more than a little taken back at the wage settlement negotiated by the Tekoa local and the Strathmore Paper company announced and signed recently. The neighboring workers signed for a base wage rate increase of eight cents an hour effective December 1 and continuing to December 1, 1946. The local unions have signed for a rate of six and seven cents an hour effective through May, 1947, at which time the entire contract will be renegotiated.

The understanding of local labor leaders had been that the Strathmore unions were to follow the trend in Holyoke, thus preserving a united front. While the difference appears to be only slight, the local union officials point out, the fact that the contract with Strathmore continues six months longer, places the burden of negotiating a new contract on the Eagle Lodge of Paper Makers and the Holyoke Paper Mill Workers union, while there continues a contract in a neighboring community, boasting of a slight wage advantage, but one which might be dissolved in favor of any additional base wage rate which could be effected here in Holyoke.

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MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, January 9, 1946.

BLANC FIXE—Prices on blanc fixe continue unchanged at prevailing levels. Demand is reported fair. The pulp is quoted at $40 per ton, in barrels, at works. The powder is quoted at $60 per ton, f.o.b. works.

BLEACHING POWDER—All-over demand continues heavy. Production high. Quotations are unchanged. Bleaching powder is currently quoted at from $2.50 to $3.10 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CASEIN—OPA maximum prices on processed acid-precipitated casein are as follows: 10,000 pounds or more 24 cents per pound; 2,000 pounds, 24½ cents per pound, less than 2,000 pounds, 24¾ cents per pound f.o.b. shipping point. Imported 24 cents.

CAUSTIC SODA—Demand very heavy. Production large, but under demand. Dry forms reported still in short supply. Solid caustic soda is currently quoted at $2.30 per 100 pounds. The flake and ground are currently quoted at $2.70 per 100 pounds. All prices in drums, car lots, f.o.b. works.

CHINA CLAY—Current demand is reported moderate on many grades of china clay. Quotations unchanged. Domestic filler clay is quoted at from $7.50 to $15 per ton; coating clay is quoted at from $12 to $22 per ton, at mines. Imported china clay is currently quoted at from $13 to $25 per long ton, ship side.

CHLORINE—Demand heavy with output increasing. Outlook now appears favorable. Chlorine is currently quoted at $1.75 per 100 pounds, in single unit tank cars, f.o.b. works.

ROSIN—No offerings or sales. The OPA price on "G" gum rosin is $6.74 per 100 pounds in barrels, at Savannah. "FF" rosin is established quoted at $6.70 per 100 pounds, in barrels at New York. Average price on seventy per cent gum rosin size is $6.95 per 100 pounds, f.o.b. works.

SALT CAKE—Prices on salt cake continue to be reported unchanged. Stocks on Oct. 1, 56,235 tons, against 58,610 tons in September. Domestic salt cake is currently quoted at $15 per ton, in bulk. Chrome cake is currently quoted at $16 per ton. All quoted prices in car lots, f.o.b. shipping point.

SODA ASH—Demand for soda ash is reported heavy. Packaged shipments still slow. Market tight. Prices continue to conform to prevailing levels. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Corn market is reported steady. Receipts larger at 125,000 bushels. Shipments lower this week. Demand heavy. Prices unchanged on starch. Pearl is quoted at $3.72 per 100 pounds. Powdered starch is quoted at $3.83 per 100 pounds. All prices in bags, car lots, f.o.b. Chicago.

SULPHATE OF ALUMINA—Demand good. Short temporary supply improving. Prices of the commercial grades are currently quoted at from $1.15 to $1.25 per 100 pounds. The iron free is currently quoted at $1.75 per 100 pounds. All prices in bags, car lots, f.o.b. works.

SULPHUR—Current consumption of sulphur continues heavy. Market situation unchanged. The quotation on annual contracts continues at $16 per long ton, f.o.b. mines. The current price on contracts at Gulf Ports is $17.50 per long ton.

TALC—Demand reported good. Domestic grades are currently quoted at from $16 to $21 per ton at mines. Canadian at $24 per ton. All prices in car lots.

MARKET QUOTATIONS

All market quotations, excepting those otherwise designated as official OPA maximum prices, are based on the manufacturers' price level as of October 1-15, 1941; maximum wholesale prices are based on the merchants' maximum prices for stipulated quantities at a quoted price to all customers of a like class, as shown by the merchant's sales records of goods delivered during March, 1942. A merchant's price list in effect in March 1942, showing quotations of actual shipments, will establish the current maximum prices.

Paper

(Delivered New York)

Standard News, per ton—			
Roll, contract	*$67.00	@	—
Sheets	75.00	@	—
* OPA Maximum Price.			
Kraft—per cwt.—Carload Quantities Zone A, Delivered			
Superstandard Wrapping	*$5.25	@	—
No. 1 Wrapping	*5.00	"	—
Standard Wrapping	*4.75	"	—
Standard Bag	*4.375	"	—
* OPA Manufacturers' Prices.			
Tissues—Per Ream—Carlots			
White No. 1	1.12½	"	—
White No. 1 M. G.	1.10	"	—
White No. 1½	1.00	"	—
White No. 2	.90	"	—
Anti-Tarnish M.F.	1.20	"	—
Colored	—	"	—
Kraft	.95	"	—
Manila	.90	"	—
Toilet—1 M. Sheets—Per Case			
Unbleached	4.25	"	—
Bleached	5.70	"	—
Unbl. Toilet, 1 M.	4.16	"	—
Bleached Toilet	5.70	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	2.20	"	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	11.25	@	—
No. 1 Manila Wrapping, 35 lb.	6.00	"	6.25
Boards, per ton—			
News	*50.00	@	—
Chip	*50.00	"	—
Sgl. Mla. Ll. Chip	*62.00	"	—
White Pat. Coated	*75.00	"	—
Kraft Liners 50 lb.	*63.00	"	—
Binders Boards	84.00	"	116.00

* OPA Base Prices per 10 tons. Less than 10 tons but over 3 tons, add $2.50; three tons or less, add $5; regular 35-39 basis, add $5.; basis 40-49, add $2.50; basis 91-100, add $2.50; basis 101-120, add $5.

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
100% Rag Ext. No. 1	$39.10	@ $46.00	$40.25	@ $47.25
100% Rag	32.20 "	37.75	33.35 "	39.25
85% Rag	.... "	....	29.90 "	35.00
75% Rag	23.00 "	27.00	24.15 "	28.25
65% Rag	.... "	....	22.80 "	27.75
50% Rag	18.70 "	22.75	19.90 "	24.25
25% Rag	16.40 "	20.00	17.55 "	21.50

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds		Ledgers	
No. 1	$10.55	@ $12.75	$11.70	@ $14.25
No. 2	9.65 "	11.75	9.80 "	13.25
No. 3	9.20 "	11.25	10.35 "	12.50
No. 4	8.90 "	10.75	10.05 "	12.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper. Delivered in Zone 1:

No. 1 Glossy Coated	$13.65	@	$15.50
No. 2 Glossy Coated	12.40	"	14.00
No. 3 Glossy Coated	11.60	"	13.25
No. 4 Glossy Coated	11.15	"	12.75
No. 1 Antique (watermarked)	10.25	"	11.75
No. 2 Offset	9.60	"	11.00
A Grade E. F.	9.35	"	10.75
A Grade S. & S. C.	9.60	"	11.00
B Grade E. F.	8.85	"	10.25
B Grade S. C.	9.10	"	10.50
C Grade E. F.	8.55	"	9.75
C Grade S. C.	8.80	"	10.00
D Grade E. F.	8.25	"	9.50
D Grade S. & S. C.	8.50	"	9.75

Ivory & India at $.50 cwt. extra.

Wood Pulp

OPA Maximum Prices and Canadian Manufacturers Prices, Less Freight Not Exceeding OPA Allowances.

Bl. Softwood Sulphite	$86.00
Unbl. Softwood Sulphite	74.00
Bl. Hardwood Sulphite	83.50
Unbl. Hardwood Sulphite	71.50
Bl. Mitscherlich	81.00
Unbl. Mitscherlich .72.00 @	82.00
N. Bleached Sulphate	86.00
S. Bleached Sulphate	79.00
N Semi-Bleached Sulphate	82.00
S Semi Bleached Sulphate	75.00
N Unbl. Sulphate	73.00
S. Unbl. Sulphate	65.50
Bl. Soda	76.00
Unbl. Soda	72.00
Groundwood	50.00

Transportation Allowances

Applying to Producers of Wet Wood Pulp.

	Below 50% Air Dry Weight
Northeast	$13.50
Lake Central	13.50
Southern	16.00
West Coast (in area)	10.50
West Coast (out area)	16.50

	50% 80% Air Dry Weight
Northeast	11.50
Lake Central	11.50
Southern	14.00
West Coast (in area)	9.50
West Coast (out area)	15.50

Applying to Producers of Dry Wood Pulp.

	Above 80% Air Dry Weight
Northeast	$8.50
Lake Central	8.50
Southern	11.00
West Coast (in area)	7.50
West Coast (out area)	13.50

Should freight charges actually exceed these allowances, the difference may be added to the maximum prices.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	6.50	@	7.25*
Silesias No. 1	—	"	5.75*
New Unbleached	6.75	"	7.50*
Blue Overall	—	"	5.50*
Fancy	—	"	3.50*
Washables	—	"	3.00*
Bleached Khaki Cuttings	—	"	4.25*
Unbleached Khaki Cuttings	—	"	3.50*

*OPA Maximum Prices

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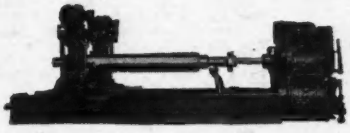

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Best for performance in the Beater and Jordan because of ease of wetting and ready dispersion in the furnish.

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Old Rags

White, No. 1—			
Repacked	*3.80	"	—
Miscellaneous	*3.20	"	—
White, No. 2—			
Repacked	*2.90	"	—
Miscellaneous	*2.65	"	—
Thirds and Blues—			
Repacked	*2.20	"	—
Miscellaneous	*1.30	"	—
Roofing Rags—			
No. 1	*1.55	"	—
No. 2	*1.45	"	—
No. 3 (bagging)	*1.35	"	—
No. 4	*1.35	"	—
No. 5A	*1.35	"	—
Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

Pre-War Quotations
All Prices Nominal

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.90	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxfords	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—
No. 4 White Linens	3.25	"	3.25
No. 1 White Cotton	4.25	"	4.75
No. 2 White Cotton	3.25	"	3.75
No. 3 White Cotton	2.50	"	3.00
No. 4 White Cotton	1.90	"	2.20
Extra Light Prints	2.00	"	2.40
Ord. Light Prints	1.75	"	2.15
Med. Light Prints	1.55	"	1.95
Dutch Blue Cottons	2.25	"	2.50
French Blue Linens	3.00	"	—
Checks and Blues	2.00	"	—
Linsey Garments	1.90	"	2.00
Dark Cottons	1.50	"	1.60
Old Shappories	1.30	"	1.45
New Shappories	1.45	"	1.50
French Blues	2.25	"	2.50

BAGGING

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	3.25	@	3.30
Wool Tares, light	3.25	"	3.50
Wool Tares, heavy	3.50	"	3.75
Bright Bagging	3.25	"	3.50
Manila Rope—			
Foreign	—	"	—
Domestic	*5.75	"	—
Jute Threads	5.50	"	—
No. 1 Sisal Strings	*4.00	"	—
Mixed Strings	2.00	"	—

* OPA Maximum Prices.

Old Waste Papers

(F. o. b. New York)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Envelope Cuts	3.12½	"	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, one cut	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Mixed Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
Mixed Groundwood Colored Shavings	.90	"	—
Overissue Magazines	1.67½	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
Mixed Books	1.10	"	—
No. 1 White Ledger	2.30	"	—
No. 2 Mixed Ledger, colored	2.00	"	—
New Manila Envelope Cuttings, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
Extra Manilas	1.95	"	—
Mixed Kraft, Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
Triple Sorted, No. 1 Brown Soft Kraft	2.50	"	—
New 100% Kraft Corrugated Cuttings	2.25	"	—
No. 1 Assorted Old Kraft	1.75	"	—
New Jute Corrugated Cuttings	.90	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.40	"	—
Box Board Cuttings	.72½	"	—
White Blank News	1.65	"	—
Overissue News	1.10	"	—
No. 1 News	1.00	"	—
No. 1 Mixed Paper	.95	"	—
Old Corrugated Containers	.82½	"	—
Mill Wrappers	1.10	"	—

Twines

All Prices Nominal
(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.21	@	—
White Hemp	.21	"	—
Fine Polished—			
Fine India	.36	"	—
Unpolished—			
Box	.17½	"	—
Paper Makers	.17	"	—
Tube Rope	.19	"	—
Wall Paper	.20½	"	—
Wrapping	.25	"	—
Soft Fiber Rope	.19	"	—
Cotton	.35	"	—

(Hard Fiber)

Medium Java	.16	"	—
Mex. Sisal	.16	"	—
Manila	—	"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill)

Shirt Cuttings—	
New White No. 1	.07¼
New White No. 2	.05¾
Light Silesias	.05¾
Black Silesias, soft	.03½
New Unbleached	.07½
Washable Prints	.04¼
Washable No. 1	.03
Blue Overall	.05½
Cottons—According to grades—	
Washable Shredding	.01¾
Fancy Percales	.04¾
New Black Soft	.03¼
Khaki Cuttings—	
Unbleachable Cotton Cuttings	.03½
Bleachable Cotton Cuttings	.04¼
Men's Corduroy	.03½
Ladies' Corduroy	.03
Cottonades	.03¼

Domestic Rags (Old)

White No. 1—Repacked	3.80	@	—
Miscellaneous No. 1	3.20	"	—
Miscellaneous No. 2	2.65	"	—
White No. 2—Repacked	2.90	"	—
Thirds and Blues—			
Miscellaneous	1.80	"	—
Repacked	2.20	"	—
Black Stockings—			
(Export)	Nominal		
Roofing Stock—			
Foreign No. 1	Nominal		
Domestic No. 1	1.55	"	—
Domestic No. 2	1.45	"	—
Roofing Bagging	1.25	"	—
Old Manila Rope	5.75	"	—

Bagging

(F. o. b. Phila.)

Gunny No. 1—			
Foreign	Nominal		
Domestic	3.00	@	3.90
No. 1 Clean bright—			
Sisal Strings	.04	"	—
No. 2 Clean bright—			
Sisal Strings	.03	"	—
Sisal Jute	.02½	"	.02¾
Scrap—			
No. 1	3.25	"	3.50
No. 2	1.75	"	1.90
Wool Tares, heavy	4.00	"	4.25
No. 1 New Light Burlap	3.00	"	4.00
New Burlap Cuttings	3.75	"	4.00

Old Papers

(F. o. b. Phila.)

OPA Maximum Prices, Baled

No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
Soft White Shavings, one cut	2.50	"	—
White Blank News	1.65	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Hard White Shavings, ruled	2.50	"	—
No. 1 Soft White Shavings	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
Hard White Envelope Cuts, one cut	3.37½	"	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
White and Colored Tabulating Cards	2.25	"	—
Ground Wood Tabulating Cards	1.35	"	—
White Blank News	1.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.95	"	—
Overissue News	1.10	"	—
Box Board Cuttings	.72½	"	—
New Corrugated Cuttings, Kraft	2.25	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.40	"	—
Jute Corrugated Cuttings	1.07½	"	—

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	2.75	@	2.90
Sisal Rope No. 1	*4.75	"	—
Sisal Rope No. 2	* —	"	4.00
Mixed Rope	—	"	1.55
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Manila Rope—			
Foreign	(nominal)		
Domestic	5.75	"	—
Soft Jute Rope	4.50	"	5.00
Jute Carpet Threads	3.00	"	3.50
Bleachery Burlap	8.13	"	9.00
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.00	"	3.25
South American	—	"	3.25

BOSTON

Old Papers

(F. o. b. Boston)

OPA Maximum Prices, Baled

No. 1 Hard White Shavings, unruled	2.87½	@	—
No. 1 Hard White Shavings, ruled	2.50	"	—
Soft White Shavings, Misc.	2.15	"	—
No. 1 Fly Leaf Shavings	1.67½	"	—
No. 2 Fly Leaf Shavings	1.12½	"	—
No. 1 Groundwood Fly Leaf Shavings	1.25	"	—
No. 2 Groundwood Fly Leaf Shavings	.90	"	—
Mixed Colored Shavings	.75	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
Hard White Envelope Cuts, one cut	3.37½	"	—
Triple Sorted No. 1 Brown Soft Kraft	2.50	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
Kraft Envelope Cuttings	3.25	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
New Manila Envelope Cuts, one cut	2.87½	"	—
New Manila Envelope Cuttings	2.65	"	—
White and Colored Tabulating Cards	2.25	"	—
Ground Wood Tabulating Cards	1.35	"	—
White Blank News	1.65	"	—
No. 1 Assorted Old Kraft	1.75	"	—
No. 1 Mixed Paper	.95	"	—
Overissue News	1.10	"	—
Box Board Cuttings	.72½	"	—
New Corrugated Cuttings, Kraft	2.25	"	—
Old 100% Kraft Corrugated Containers	1.75	"	—
Old Corrugated Containers	1.40	"	—
Jute Corrugated Cuttings	1.07½	"	—

Bagging

(F. o. b. Boston)

Gunny Bagging—			
Foreign	(nominal)		
Domestic	2.75	@	2.90
Sisal Rope No. 1	*4.75	"	—
Sisal Rope No. 2	* —	"	4.00
Mixed Rope	—	"	1.55
Transmission Rope—			
Foreign	(nominal)		
Domestic	2.75	"	3.00
Manila Rope—			
Foreign	(nominal)		
Domestic	5.75	"	—
Soft Jute Rope	4.50	"	5.00
Jute Carpet Threads	3.00	"	3.50
Bleachery Burlap	8.13	"	9.00
Scrap Burlap—			
Foreign	(nominal)		
Domestic	3.00	"	3.25
South American	—	"	3.25
Wool Tares—			
Foreign	(nominal)		
Domestic	4.25	"	—
Aust. Wool Pouches	—	"	3.65
New Zealand Wool Pouches	—	"	3.80
New Burlap Cuttings	4.75	"	5.00
Heavy Baling Bagging	4.00	"	4.25
Paper Mill Bagging	2.50	"	3.00
No. 2 Roofing Bagging	1.35	"	—

* OPA Maximum Prices.

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints	.04½	@	.04¾
Fancy Percales	.04¾	"	.05
New White No. 1	.06¾	"	.07
New Light Flannelettes	.05¾	"	.06
Canton Flannels, Bleached	.06	"	.06¼
Underwear Cutters, Bleached	.06¼	"	.06½
Underwear Cutters, Unbleached	.05¾	"	.06
Silesias No. 1	.06	"	.06¼
New Black Silesias	.03	"	.03½
Red Cotton Cuttings	.03½	"	.04
Soft Unbleached	.06¼	"	.06½
Blue Cheviots	.06¼	"	.06
Fancy	.03¾	"	—
Washable	.02½	"	—
Khaki Cuttings	.02½	"	.03
O. D. Khaki	.03¼	"	.03½
Corduroy	.03½	"	.03¾
New Canvas	.04½	"	.04¾
B. V. D. Cuttings	.06¾	"	.06¾

Domestic Rags (Old)

(F. o. b. Boston)

White No. 1—			
Repacked	3.80	@	—
Miscellaneous	3.20	"	—
White No. 2—			
Miscellaneous	2.65	"	—
Twos and Blues, Repacked	2.20	"	—
Old Blue Overalls	3.15	"	3.30
Thirds and Blues, Repacked	2.20	"	—
Miscellaneous	1.80	"	—
Black Stockings	3.50	"	4.00
Roofing Stock—			
No. 1	1.55	"	—
No. 2	1.45	"	—
No. 3	1.35	"	—
No. 4	1.35	"	—
No. 5, Quality A	1.35	"	—
Quality B	1.30	"	—
Quality C	.25	"	—
Old Manila Rope	5.75	"	—

* OPA Maximum Prices.

Foreign Rags

(F. o. b. Boston)

Canvas	(nominal)
Dark Cottons	(nominal)
Dutch Blues	(nominal)
New Checks and Blues	(nominal)
Old Fustians	(nominal)
Old Linsey Garments	(nominal)
New Silesias	(nominal)

CHICAGO

Waste Paper

(F. o. b. Chicago)

OPA Maximum Prices, Baled

Shavings—			
No. 1 Hard White Envelope Cuts, one cut	3.37½	@	—
No. 1 Hard White Shavings, unruled	2.87½	"	—
No. 1 Soft White Shavings	2.50	"	—
No. 1 White Ledger	2.30	"	—
No. 1 Heavy Books & Magazines	1.92½	"	—
White Blank News	1.65	"	—
Mixed Kraft Env. & Bag Cuttings	2.75	"	—
No. 1 Assorted Old Kraft	1.75	"	—
Overissue News	1.10	"	—
No. 1 News	1.00	"	—
No. 1 Mixed Paper	.95	"	—
No. 1 Roofing Rags	1.55	"	—
No. 1 Roofing Rags	1.45	"	—